

# *Chapter 2 – Alternatives*

## **2.1 Introduction**

An important step in the CCP planning process is the development and analysis of alternatives. Alternatives are developed to explore and analyze different ways to achieve Refuge purposes, contribute to the mission of the NWRs, meet Refuge goals, and resolve issues identified during scoping and throughout the CCP process. This chapter describes the process that was followed to develop management alternatives for the Sweetwater Marsh and South San Diego Bay Units, and provides detailed descriptions of these alternatives. Each Unit is addressed in a separate section, with each section containing a comparison of the alternatives considered, a summary of the similarities among those alternatives, and a discussion of alternative components that were considered, but eliminated from detailed study. The “preferred” management alternative for each Refuge Unit is also identified.

Preferred alternatives may be modified following the completion of the public review and comment period based on comments received from the public or another agency. The Final EIS will include a “proposed decision” for each Refuge Unit. The proposed decision may look very similar to the preferred alternative, or it could include a combination of components from two or more of the alternatives presented in the draft CCP/EIS.

As a joint CCP/EIS, this document is intended to fulfill the Service’s responsibilities under NEPA. Therefore, considerable effort was taken to develop a reasonable range of feasible management alternatives for each Refuge. The Council on Environmental Quality’s NEPA Regulations describe the alternatives section as the heart of the EIS. As such, the alternatives presented in an EIS should be reasonable and implementable, must be given equal treatment, and must provide clear choices for the decision maker. A reasonable range of alternatives generally includes several “action” alternatives and a “no action” alternative. The action alternatives involve various changes to past and present management activities, while the no action alternative would result in no change to current management practices. The no action alternative serves as the baseline to which all other action alternatives are compared.

### **2.1.1 Alternative Development Process**

The development of alternatives is not a sequential process. Proposed alternatives are changed or further refined based on the findings of issue assessment; development of goals, objectives, and strategies; and an analysis of impacts and benefits. Before the process of developing alternatives began, the planning team reviewed and evaluated the scoping comments received in response to the Notice of Intent (NOI), as well as the comments provided at a series of public workshops held to discuss management activities and public uses on the Refuge. A list of major issues related to the management of the San Diego Bay NWR was developed using this input, along with additional input from the planning team and other Service staff (refer to Section 1.10). Once the issues were defined, the team began the process of articulating the Refuge vision and goals. Through further analysis of the issues and general public comment, the team developed various objectives and strategies for achieving Refuge goals, the mission of the NWRs, and other mandates. The objectives and strategies address wildlife and habitat management, habitat enhancement and restoration, maintenance and monitoring, environmental contaminants investigation and remediation, fire management, protection and management of cultural resources, and public use.

The potential for habitat enhancement and/or restoration on the two Refuge Units was an important consideration in developing the alternatives. This was particularly true for the South San Diego Bay Unit, which was established, in part, to enable consideration of potential restoration opportunities within the existing salt ponds. As part of the process of developing enhancement and restoration options, the planning team sought input from Refuge stakeholders, biologists experienced in the ecological study and restoration of coastal habitats, and the public at large. To facilitate public discussion, the planning team held several focused workshops. The first workshop was held in February 2001 addressed general issues related to habitat management and restoration. From the discussions at that meeting and a series of subsequent planning team meetings, nine conceptual enhancement and restoration options were prepared for the South San Diego Bay Unit. Another public workshop was held in March 2001 to receive public input on these nine conceptual proposals. The restoration proposals were also posted on the CCP web page and additional comments were solicited. After considering the input generated at these meetings and through the web page, the planning team further refined the enhancement and restoration options and incorporated the options into distinct alternatives. These enhancement and restoration alternatives were discussed at a public workshop held on May 22, 2001. Also during the May 2001 meeting, the planning team introduced enhancement and restoration options for portions of the Sweetwater Marsh Unit. Management alternatives for the Sweetwater Marsh Unit were then developed using the same process used to develop alternatives for the South San Diego Bay Unit. The enhancement and restoration alternatives were further refined during the analysis of environmental consequences.

The public use components of each alternative were developed in a similar manner. Priority consideration was given to uses involving hunting, fishing, wildlife observation and photography, and environmental education and interpretation (refer to Section 1.5.2.1 for more information regarding wildlife-dependent recreational uses). The planning team also evaluated those uses already permitted on the Refuge, as well as various other uses suggested by the public and interested agencies during scoping and at the public use workshops. As a result, a range of public use proposals have been incorporated into the various alternatives for each Refuge Unit.

The alternatives that have been developed for the Sweetwater Marsh and South San Diego Bay Units are summarized below and described in detail in Sections 2.2 and 2.3.

## **2.1.2 Summary of Alternatives for Each Refuge Unit**

### **2.2.1.2 Sweetwater Marsh Unit**

- **Alternative A, No Action** – This alternative assumes no change to past and present management activities on this Refuge Unit. Under this alternative, there would be no new wildlife and habitat management programs, no proposals to enhance or restore habitat, and no changes to the current public use program.
- **Alternative B, Implement Habitat Enhancement** – This alternative places greater emphasis on habitat management and enhancement, particularly the enhancement of tidal circulation within the Unit's intertidal habitats and enhancements at the D Street Fill to benefit nesting seabirds and plovers. Opportunities for wildlife observation and environmental education would remain unchanged; however, new opportunities for environmental interpretation are proposed at Paradise Marsh and F&G Street Marsh.
- **Alternative C, Preferred Alternative: Implement Habitat Enhancement and Restoration and Improve Existing Public Uses** – This alternative further expands the wildlife and habitat management activities described in Alternative B to include

both habitat enhancement and habitat restoration. Various proposals for restoring intertidal, upland, and upland transitional habitats are presented. In addition, the trail system and associated interpretive elements on Gunpowder Point would be redesigned to complement existing environmental education and interpretation programs.

### 2.1.2.2 **South San Diego Bay Unit**

- **Alternative A, No Action** – This alternative assumes no change to past and present management activities on this Unit. As a result, the management practices identified as necessary when the Unit was established in 1999 would continue to be implemented. This would include actions required to enhance nesting and foraging opportunities for the California least tern, as described in the Cooperative Agreement between the Service and the Port (refer to Section 1.6.3). The public uses currently permitted on the Unit, including fishing, wildlife observation, environmental education, and boating, would be retained at present levels and no new uses would be initiated. In addition, commercial solar salt production would continue to operate on the Refuge Unit under a Refuge Special Use Permit.
- **Alternative B, Expand Habitat Management and Enhance Nesting Opportunities**  
Under this alternative, habitat values for California least tern, western snowy plover, and colonial nesting seabirds would be improved by enhancing the nesting substrate on various salt pond levees, recontouring levee surfaces to improve access from nesting areas to the edge of the ponds, and increasing overall acreage of potential seabird nesting habitat within the salt pond system. This alternative also proposes the creation of additional roosting habitat within the salt ponds for California brown pelicans (*Pelecanus occidentalis californicus*). Existing public uses would continue, however no new uses would be provided. Commercial solar salt production would also continue under this alternative.
- **Alternative C, Expand Habitat Management, Enhance Nesting Opportunities, Implement Habitat Restoration, and Expand Existing Public Use Opportunities**  
This alternative proposes to restore native habitat within the Otay River floodplain and within some of the existing salt ponds. The seabird nesting and pelican roosting enhancements described under Alternative B are also included under this alternative. Approximately 140 acres of wetland and upland habitat would be restored within the Otay River floodplain and up to 440 acres of intertidal habitat would be restored within the salt works. In addition, under this alternative the public use program would be expanded to include additional opportunities for fishing and wildlife observation. The number of guided nature tours currently conducted within the salt works would increase. Solar salt production would continue, but within a reduced footprint.
- **Alternative D, Preferred Alternative: Expand Habitat Management, Enhance Nesting Opportunities, Maximize Habitat Restoration, and Provide Additional Public Use Opportunities** – Under this alternative, the habitat potential of the salt ponds would be maximized. Approximately 650 acres of existing salt ponds would be restored to tidal influence, with much of the restoration targeted for cordgrass-dominated salt marsh habitat. Approximately 33 acres of new seabird nesting habitat would be created and a managed water area of approximately 275 acres would be maintained within the existing pond system. About 45 acres of this ponded water area would be managed to create conditions favorable for brine invertebrates, a resource currently exploited by migratory birds such as phalaropes and eared grebes. The

nesting and roosting enhancements, described in Alternative B, and the restoration options for the Otay River floodplain, described in Alternative C, are also included as part of this alternative.

The existing public use program would be expanded to include opportunities for environmental interpretation, while also increasing opportunities for wildlife observation and photography. Fishing and boating activities would continue to be permitted within the bay, but the proposal to provide an opportunity for shoreline fishing, as proposed in Alternative C, would not be implemented under this alternative. Implementation of this alternative would result in the ultimate elimination of commercial solar salt production in the south bay.

## **2.2 Alternatives for the Sweetwater Marsh Unit**

### **2.2.1 Similarities Among Alternatives**

Although there are distinct differences among the range of alternatives developed for the Sweetwater Marsh Unit, a number of management components are common to all of the alternatives and would be part of the CCP regardless of the alternative selected for implementation.

#### **2.2.1.1 Features Common to All Alternatives**

Features common to all alternatives are summarized below. To reduce repetition in the alternative descriptions, those features that are common among all of the alternatives are described in detail only under Alternative A, No Action (refer to Section 2.2.2.1).

- *Annual Site Preparation at D Street Fill* – Each year, prior to the commencement of the California least tern and western snowy plover nesting season, approximately 30 acres at the western end of the D Street Fill would be disked or graded to remove weedy vegetation in preparation for seabird and shorebird nesting activity.
- *Monitoring of Listed Species* – Nesting activity and breeding productivity of California least tern and western snowy plover would be monitored annually per available funding at the D Street Fill. Annual surveys to monitor the light-footed clapper rail population on the Refuge would also be conducted.
- *Multiple Species Conservation Program (MSCP) Monitoring* – Annual monitoring would be conducted on the Refuge for salt marsh bird's beak and Nuttall's lotus (*Lotus nuttallianus*) in accordance with agreements made by the Service when the City of San Diego's MSCP was approved.
- *Light-footed Clapper Rail Captive Breeding Protocol Development Program* – The refuge staff would continue to be involved in the current efforts to develop captive breeding protocol for the light-footed clapper rail.
- *Invasive Plant Species Control* – Periodic control of invasive plant species would be implemented to enhance the quality of the native habitats on this Refuge Unit. The primary focus of this control would be in upland and upland transition areas.
- *Partnering in Debris and Litter Cleanup* – Periodic debris removal and litter cleanup would be conducted on the Refuge in partnership with other agencies and non-governmental organizations.

- *Management of Mitigation Leasehold Overlays* – The 83 acres of Refuge land currently encumbered by mitigation leasehold overlays (refer to Section 1.6.2) would continue to be managed in their current condition until these areas are restored by the leaseholder or the leaseholds expire. If the leaseholder proposes restoration for all or a portion of a leasehold overlay, the Refuge Manager would be responsible for reviewing and approving restoration proposals prior to their implementation.
- *Environmental Contaminants Coordination* – With assistance from the Service’s Division of Environmental Contaminants, Refuge staff would work with surrounding jurisdictions, adjacent property owners, and other affected state and local agencies to identify and, where applicable, remediate contaminated areas within the Sweetwater Marsh Unit and/or within adjacent parcels if Refuge resources could be adversely affected.
- *Protection of Cultural Resources* – Cultural resources would be managed in accordance with public law and agency policy. The Refuge Manager would continue to consider the effects of the proposed action on the Refuge’s archaeological and historic properties and would consult with the State Historic Preservation Office (SHPO), federally recognized Tribes, and interested parties prior to implementing any ground-disturbing projects.
- *Public Access Restrictions* – The public would continue to access the Refuge via a shuttle bus provided by and operated for the Chula Vista Nature Center at no charge to the riders. Once on the Refuge, public access to Gunpowder Point would be permitted via a designated trail system. All other areas within this Refuge Unit would remain closed to general public access.
- *Opportunities for Wildlife Observation and Photography* – Opportunities for wildlife observation and photography would be provided at the Chula Vista Nature Center, along a trail system on Gunpowder Point, and at the bird observation pavilion located near the southwestern corner of Gunpowder Point.
- *Environmental Education and Interpretation Partnerships* – Environmental education programs, such as the Sweetwater Safari, would be provided through partnerships with the Chula Vista Nature Center, the San Diego Zoological Society, and others. Opportunities for environmental interpretation would be provided at the Nature Center, as well as along a trail system on Gunpowder Point.
- *Facilitation of Appropriate Scientific Research* – Scientific research activities would be permitted with a Refuge Special Use Permit provided the activities are consistent with Refuge purposes and the mission of the NWRs.
- *Chula Vista Nature Center* – The Chula Vista Nature Center would continue to operate on the 3.3 acres of the Refuge set aside for this use when the Sweetwater Marsh Unit was established.
- *Fire Management* – The San Diego NWR Complex has developed a fire management plan for all of the Refuges within the complex. The plan, which is provided as Appendix L, emphasizes prevention and suppression as the primary fire management tools for this Refuge Unit. Fire prevention activities would include non-native brush

clearing along the eastern edge of the D Street Fill and around the Refuge office on Gunpowder Point.

- *Predator Management* – Predator management that focuses on reducing the adverse effects of predators on listed species, including the California least tern, western snowy plover, and light-footed clapper rail, would be implemented. A draft predator management plan is provided in Appendix M.

### **2.2.1.2 Features Common to All Action Alternatives**

These features are common to all of the action alternatives, but would not be implemented as part of the no action alternative.

- *Expanded Marsh Management* - Although the level of detail varies, each of the action alternatives includes a proposal to expand Refuge management activities within the marsh complex. These additional activities would be implemented to ensure the long-term protection of the marsh's species diversity and environmental health, while also implementing many of the measures included in Service-approved recovery plans for the light-footed clapper rail, salt marsh bird's beak, and California least tern, and the draft recovery plan for the western snowy plover.
- *Improvements to Tidal Circulation* – Both action alternatives include proposals that would improve tidal circulation within the Refuge's salt marsh habitat by removing fill material placed within the marsh prior to Refuge establishment; installing an additional culvert in the existing access road; and removing or lowering the weir at the south end of Paradise Marsh.
- *New Opportunities for Environmental Interpretation* – Under Alternatives B and C, the Service would work in partnership with the appropriate municipalities to develop and install interpretive signage in the public rights-of-way adjacent to Paradise Marsh and the F&G Street Marsh.

## **2.2.2 Detailed Description of the Alternatives**

### **2.2.2.1 Alternative A - No Action**

Under the no action alternative (Figure 2-1), the current management practices on the Sweetwater Marsh Unit would remain unchanged and existing public uses would continue at present levels. No new management practices or public uses would be initiated.

The Sweetwater Marsh Unit currently operates without an official management plan. Under the no action alternative, the current management activities would be incorporated into the CCP to formally establish ongoing management direction for this Refuge Unit for the next 15 years. Management direction is also guided by various laws, treaties and executive orders, applicable Service recovery plans, and the recommendations developed in association with ongoing migratory bird planning efforts. (For more information about applicable recovery plans and migratory bird planning efforts, refer to Section 3.4.1.3 and for specific legislative mandates and authorities, refer to Section 5.1.)

### **Wildlife and Habitat Management**

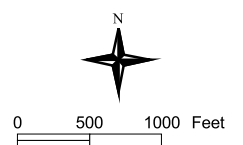
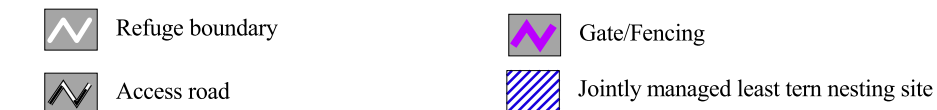
#### **Endangered and Threatened Species and Other Species of Concern**

Under this alternative, wildlife and habitat management activities would continue to focus on the protection and recovery of the federally listed endangered and threatened species





**Figure 2-1 Sweetwater Marsh Unit, Alternative A**



Source: USFWS, Local Agency Partnership 2000 (2 ft imagery)

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supported on this Refuge Unit. Current management actions also provide benefits to state listed species, species identified as Birds of Conservation Concern, and species covered by the City of Chula Vista's Multiple Species Conservation Program Subarea Plan (2003).

California Least Tern and Western Snowy Plover: The portion of the D Street Fill (refer to Figure 1-3) that is included within the Refuge boundary consists of approximately 55.5 acres. The western end of the Fill would continue to be managed as nesting habitat for California least terns and western snowy plovers. When the Refuge was established, 25 acres in the western end of the Fill (12 acres of Port land and 13 acres of Refuge land) were set aside for protection and maintenance as least tern nesting habitat. Since that time, another 10 acres within the Refuge have been permanently designated as least tern nesting habitat. Under this alternative, annual site preparation would involve disking or grading approximately 40 acres at the western end of the D Street Fill prior to the nesting season. This activity would occur in partnership with the Port and would include preparation of both Refuge land and Port property.

Bi-weekly monitoring of nesting activity at the D Street Fill would also continue to be conducted per available funding from March through September of each year. Monitoring would involve the recording of nest locations, dates of nest initiation, pair number estimates, tallying of total nesting attempts, hatching success, chick banding, estimates of fledgling productivity, and incidental observations. At the end of each season, an annual report would be issued to summarize the year's monitoring results and, if necessary, suggest changes in management to improve fledgling productivity in subsequent years.

Predator management would continue to be implemented to reduce the loss of California least tern and western snowy plover adults, chicks, and eggs to mammalian and avian predation. (More information is provided below under Step-Down Management Plans.)

Light-footed Clapper Rail: Surveys of the light-footed clapper rail population within the Sweetwater River wetlands complex began in the early 1980s, prior to establishing the Sweetwater Marsh Unit. Since Refuge establishment, two types of surveys have been conducted to monitor the clapper rail population. A high tide survey is conducted between December and January of most years. Breeding call surveys are conducted between February and March of each year. Clapper rail surveys would continue under this alternative and the data obtained would be recorded and compared to data for other years and from other locations in Southern California in an effort to better understand the current status of the light-footed clapper rail throughout its range.

Salt Marsh Bird's Beak: Salt marsh bird's beak is included in the list of MSCP covered species prioritized for annual field monitoring, therefore, annual surveys to verify the presence and determine the size and location of the Refuge's salt marsh bird's beak populations would continue in accordance with the Biological Monitoring Plan for the Multiple Species Conservation Program (Ogden 1996). Annual monitoring of this species provides data necessary to assess both immediate threats and long-term population trends.

### **Management Activities**

Under this alternative, habitat management activities would include maintaining and enhancing existing habitat values for Refuge wildlife and plants. A step-down Habitat Management Plan (HMP) would be prepared to provide specific guidance for the implementation of habitat management strategies. Such activities would include trash and debris cleanups, periodic control of invasive plants, and enforcement of regulations



established to protect habitat values. Refuge staff would continue to support cleanups conducted in partnership with non-governmental organizations, such as the Port Tenants Association, which assists in the periodic removal of large debris from the marsh.

**Invasive Species:** Control of invasive species would focus on removing non-native terrestrial plants that invade the fringes of the high marsh and adjacent uplands. The most problematic species, including hottentot fig (*Carpobrotus edulis*), pampas grass, tree tobacco, fennel, myoporum (*Myoporum laetum*), garland chrysanthemum, giant reed, and tamarisk would receive the greatest attention.


**Mitigation Leasehold Overlays:** Approximately 83 acres of the Sweetwater Marsh Unit were designated as mitigation leasehold overlays by the Court when the Refuge was established. The locations of these overlays are illustrated in Figure 2-2. According to the Stipulated Settlement (refer to Section 1.6.2), the leaseholder may use, in whole or in part, any of the specified lands for wildlife habitat enhancement projects, upon approval of the Service. On March 27, 1998, the Service and Chula Vista Capital, the leaseholder of record at the time the MOU was signed, entered into an agreement that further refined the types of enhancement projects that would be appropriate for the mitigation leasehold overlay areas. The habitat types proposed for these areas are presented in Table 2-1.

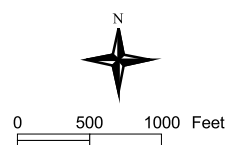
<b>Table 2-1</b> <b>Preferred Restoration Proposals for the Mitigation Leasehold Overlays</b> <b>Per the Approved Memorandum of Understanding</b>		
<b>Overlay Location<sup>1</sup></b>	<b>Preferred Habitat Type</b>	<b>Acres to be Restored</b>
D Street Fill	Intertidal wetlands	27.0 acres
Gunpowder Point	Intertidal wetlands or native uplands	7.5 acres
	Intertidal wetlands or freshwater wetlands	2.0 acres
	Native uplands	23.0 acres
F&G Street Marsh	Intertidal wetlands (salt marsh)	17.5 acres
Parcel 10g	Preservation/rehabilitation of wetlands	2.0 acres

The procedures for reviewing proposed enhancement projects are provided in the terms and agreements included in Exhibit 4 of the Agreement and Escrow Instructions, which were approved as part of the Stipulated Settlement. These procedures address when and how to submit a project to the Service for review and set forth the responsibilities of the Service and the leaseholder for processing and implementing an enhancement project. Table 2-2 outlines the procedures the Refuge Manager must follow when evaluating an enhancement proposal. All enhancement projects will require review under NEPA and the leaseholder would be responsible for any costs incurred by the Service in association with completing the NEPA process. The terms and agreements of the MOU remain in effect until 2010; therefore, restoration of the mitigation leasehold overlays could be implemented in accordance with the procedures outlined in Table 2-2 under this or any of the other alternatives until the MOU expires.



**Figure 2-2 Location of Mitigation Leasehold Overlays on Sweetwater Marsh Unit**

 Refuge boundary



Source: USFWS, Local Agency Partnership 2000 (2 ft imagery)

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**Table 2-2**  
**Review Procedures for Proposed Wildlife Habitat Enhancement Projects**

**Introduction:**

All wildlife habitat enhancement projects for lands covered by a leasehold interest are subject to approval by the Service. A wildlife habitat enhancement project is defined as a project that increases the habitat values for fish and wildlife resources by improving existing conditions or by creating new habitat types.

**Procedures:**

1. A written notice shall be provided to the Service of any proposed wildlife habitat enhancement project. This notice shall include a legal description of the property to be used for the project; a description of the proposed development requiring mitigation, if any; and a description of the wildlife habitat enhancement project, including a monitoring program and permit applications for any required Federal permits. If the leaseholder assigns its rights under the lease in whole or in part to another party, the notice shall also include the name, address, and telephone number of the assignee.
2. Within 60 days of receipt of the written notice and completion of the application, the Service shall render its decision regarding the proposal. The Service has an additional 10 working days to provide written notice of the decision to the applicant. Service approval of a proposed wildlife habitat enhancement project shall take into consideration the following criteria:
  - a. Implementation of the proposed enhancement project will:
    - Promote the protection, preservation, and conservation of an endangered or threatened species;
    - Improve habitat values on the refuge for migratory water associated birds and/or other trust resources;
    - Aid in developing wildlife and ecological conservation through increasing habitat values and/or providing for increased educational and passive recreational opportunities; and,
    - Aid in the management of wildlife and wildlands to obtain maximum benefit.
  - b. The proposed enhancement project is technically feasible.
  - c. The enhancement project, if proposed for mitigation, offsets impacts from development in the coastal areas of San Diego, Orange, and Los Angeles Counties.
3. The Service may require conditions of approval including, but not limited to, requirements that the project meet specified success criteria and/or the applicant post a performance bond to insure proper performance.
4. The applicant shall be responsible for carrying out all aspects of the enhancement project including obtaining all required permits and preparing the required NEPA document under Service direction.
5. The Service shall be responsible for approval and sign off of the final NEPA document and oversight of the enhancement project's final design and implementation.
6. The Service shall notify the applicant in writing via certified mail when the enhancement project is deemed complete.
7. On notification of completion, the applicant shall execute a quitclaim deed in favor of the United States for the area described in the legal description for the enhancement project.

Sources: Exhibit 4, Agreement and Escrow Instructions (US District Court 1988a)  
Chula Vista Mitigation Credit MOU (USFWS 1998)



All potential mitigation credits associated with these mitigation leasehold overlays expire in 2010, as stated in the 1998 MOU.

Captive Propagation Protocol Development Program for Light-footed Clapper Rail: Some of the ongoing activities associated with the captive propagation protocol development program for the light-footed clapper rail (refer to Section 1.7.2) occur on Gunpowder Point. Refuge staff along with a number of other partners participates in this program, which involves the captive propagation and release of juvenile clapper rails. Three large enclosures have been installed over an existing drainage on Gunpowder Point to house captive bred juvenile birds until they are ready for release. These activities would continue under this alternative.

### **Public Use Program**

#### **Public Access**

Under current conditions, public access on to the Refuge Unit is limited to Gunpowder Point, which can only be accessed via a shuttle bus operated by the City of Chula Vista. Due to the proximity of the access road to sensitive marsh habitat, foot and bicycle access to Gunpowder Point is prohibited. The remainder of the Refuge is and would continue to be closed to public use. The only exception involves approved research activities conducted under the auspices of a Refuge Special Use Permit.

The shuttle bus, which provides access to Gunpowder Point, is operated by the Chula Vista Nature Center and is currently available free for all uses. Visitors are transported to Gunpowder Point from an offsite parking lot located at the western terminus of E Street in Chula Vista. This parking lot is easily accessible via car from I-5 and is within walking distance of the E Street trolley stop. Public access onto Gunpowder Point is permitted when the Chula Vista Nature Center is open (generally, Tuesday through Sunday, 10:00 AM - 5:00 PM, except major holidays). Approximately 35,000 people visited the Nature Center and adjacent Refuge trail system during 2003. Other vehicular travel on the Refuge access road is restricted to Refuge and Chula Vista Nature Center staff and volunteers, school buses, and general delivery and maintenance vehicles serving the Refuge office and Nature Center.

#### **Wildlife-Dependent Recreational Uses**

The wildlife-dependent recreational uses currently permitted include wildlife observation and photography and environmental education and interpretation. Under the no action alternative, these uses would not be expanded and no additional uses would be provided.

Wildlife Observation and Photography: All opportunities for wildlife observation and photography are currently provided on Gunpowder Point. Specifically, these opportunities are provided within the Chula Vista Nature Center, from a bird blind situated near the edge of the bay along the Unit's southwest boundary, and along the existing interpretive trail that occupies the western end of Gunpowder Point (refer to Figure 2-1). From these facilities, Refuge visitors are able to observe migratory birds foraging within the adjacent salt marsh habitat and along tidal mudflats that border San Diego Bay. From the bird blind and some portions of the trail, visitors can also experience the sights and sounds of black brant (*Branta bernicla nigricans*), elegant terns (*Sterna elegant*), and other migratory birds rafting and foraging in the bay. Under this alternative, these opportunities for wildlife observation and photography would remain unchanged.

Environmental Education: The Sweetwater Marsh Unit provides the setting for a number of environmental education programs that benefit students from throughout the region, but particularly those students from schools in the surrounding cities of Chula Vista and National City. These programs represent a collaborative effort involving the Service, the Chula Vista Nature Center, other public agencies, and various non-profit organizations. Assistance is also provided through grants from private companies and state and local agencies. The Chula Vista Elementary School District participates in one program that focuses on a science and social studies curriculum. The program serves some 12,000 kindergarten through 12th grade students annually. Gunpowder Point provides the outdoor classroom for this program where students study topics such as the tides, water quality, native vegetation, and birds.

Sweetwater Safari is another program, jointly created by the San Diego Zoological Society, Chula Vista Nature Center, and the San Diego NWR Complex through a private grant to the Zoo's Habitat Conservation Education Department. This program, which meets the State of California's science standards for fourth grade, was created for students to learn about science and the local environment through a hands-on experience. The program includes on-site curriculum that is conducted on the Refuge and a post-visit curriculum that is conducted in the classroom. The on-site curriculum is taught by the teachers at Gunpowder Point. To lead the self-guided on-site program, the teacher must first participate in a training session conducted by Refuge staff, Chula Vista Nature Center staff, and other volunteer teachers. These training sessions are conducted quarterly at the Chula Vista Nature Center and are provided free of charge. Once a teacher has completed this training, he or she can arrange a time with the Nature Center to guide his/her class through the program. Equipped with backpacks containing relevant educational materials, the class travels along the 0.5-mile trail system on Gunpowder Point, gathering information about the many resources supported by the Refuge. The Refuge trails are flat, wide, and wheelchair accessible. Transportation grants to bring student onto the Refuge are available for this program.

Kimball Elementary School conducts another program in National City that is supported by the Refuge. This program generally occurs just upstream of the Refuge and presents a science and mathematics-based curriculum focused on the protection of watersheds, the function of wetland systems, and water quality testing.

Under this alternative, the Sweetwater Marsh Unit would continue to serve as an outdoor classroom and Refuge staff would continue to partner with various agencies and organizations to facilitate these programs. The Refuge would also continue to partner with the Chula Vista Nature Center, San Diego Zoo, Kimball Elementary, Paradise Creek Educational Park, Aquatic Adventures, and others to facilitate occasional field trips to the Refuge to support the organizations' desire to introduce students to the biological and cultural resources of the region, including the wildlife and plant resources found on the Refuge. The majority of these programs incorporate language arts, math, and social sciences into their curriculum in accordance with California State Education Standards. Several of these programs have been developed to reach the underserved youth of the region who have had little opportunity to experience the natural environment first hand.

Environmental education programs are conducted on this Refuge Unit once or twice a week throughout the year, with field trip opportunities open to only one classroom of approximately 32 students per day. Participants are generally transported to the site by



bus or van. In some cases, students arrive via the existing shuttle bus provided by the City of Chula Vista.

**Environmental Interpretation:** Interpretive panels installed along an existing half-mile trail system located on Gunpowder Point provide interpretation of the resources found on the Sweetwater Marsh Unit (refer to Figure 2-1). These panels offer general information about the wildlife and coastal habitats found in and around the Sweetwater Marsh Unit. Information about the Hercules Powder Company, which occupied a 30-acre site on Gunpowder Point between 1916 and 1920, is also provided along the trail. Interpretation of Refuge resources has also been incorporated into the interpretive themes of the Chula Vista Nature Center, which is described in greater detail below.

**Fishing and Hunting:** No opportunities for fishing and hunting are currently provided on this Refuge Unit and these uses would not be added under this alternative.

### **Other Public Uses**

**Chula Vista Nature Center:** Operated by the City of Chula Vista, the Chula Vista Nature Center is located on 3.33 acres within the Refuge Unit (refer to Figure 2-1) and was constructed on Gunpowder Point before the Refuge's establishment. When the Court conveyed Gunpowder Point to the Service as part of the Stipulated Settlement Agreement described in Chapter 1, it stipulated that the conveyance of the land would be subject to the existing 3.33-acre easement granted by the private landowner for the Chula Vista Nature Center. The Settlement Agreement also stipulated that the Nature Center would be permitted to utilize the Refuge access road for vehicle entrance and exit.

The Nature Center includes indoor and outdoor exhibits that interpret the resources and natural processes associated with San Diego Bay. There are several live animal exhibits, including an aviary that includes shorebirds commonly found in the area, as well as several breeding pairs of light-footed clapper rails. The Nature Center is an important partner in the Refuge's environmental education and interpretation programs, as described above. Several times a week, Nature Center docents lead small groups of people on interpretive walks along the Refuge's trail system. Although use of the interpretive trail system is available to the public free of charge, an admission fee is collected by the City of Chula Vista to explore the indoor and outdoor exhibits provided within the Nature Center. No changes to the operation of the Nature Center are proposed under this alternative.

**Walking Trail:** Approximately 0.5 miles of unpaved trails traverse Gunpowder Point providing access up to the edge of the bay (see Figure 2-1). This trail system was developed to facilitate the various wildlife-dependent recreational uses described above. All public access on this Unit is restricted to the Nature Center and this adjacent trail system. Post and cable fencing has been installed along the trail to discourage entry into adjoining sensitive habitat areas. No changes to the trail system would occur under this alternative.

**Research:** Opportunities for biological research have been provided at the Sweetwater Marsh Unit since its establishment. Several research projects have investigated the structure and function of salt marsh ecosystems, while others have involved research on a specific wildlife or botanical resource. All proposed research projects are reviewed for consistency with Refuge purposes and the mission of the NWRs. When deemed consistent, the researcher is issued a Refuge Special Use Permit. The permit may include conditions that the recipient must follow during research activities to avoid adverse

impacts to Refuge resources. Once the research is completed, the researcher is required to provide Refuge staff with the results of the research, including subsequent publications.

### **Environmental Contaminants Coordination**

Field observations, historic records of past land use activities, and limited soil and water sampling indicate that contaminants are present in several locations within the boundaries of the Sweetwater Marsh Unit. Present management of known and potentially contaminated properties generally involves coordination with the Service's Division of Environmental Contaminants, State and local agencies, and adjacent property owners. Currently, the Service is actively participating in projects related to two contaminated sites: Paradise Marsh, where an adjacent historic burn dump and other activities have impacted Refuge resources, and F&G Street Marsh, where contaminants from illegal dumping and runoff from upstream industrial uses are present in marsh sediments.

A Contaminant Assessment Process (CAP) has been completed for the Sweetwater Marsh Unit that documents and assesses the potential threats posed by environmental contaminants to Refuge lands and trust resources. The completed CAP prioritizes sampling and/or cleanup actions, recommends proposals for future investigations, and describes appropriate methods for initiating pollution prevention activities on the Refuge, as well as within the surrounding area.

### **Cultural Resource Management**

It is the policy of the NWRS to identify, protect, and manage cultural resources located on Service lands and affected by Service undertakings for the benefit of present and future generations. Several archaeological resources have been identified on the Sweetwater Marsh Unit, including archaeological and historic sites. The known archaeological sites on the Refuge were previously recorded, tested, and determined to be ineligible for inclusion on the National Register of Historic Places (NRHP). There is however a historic site on Gunpowder Point, the Hercules Powder Company historic site, that has not yet been evaluated for eligibility to the NRHP. Prior to the initiation of any actions that could affect this resource, this site must be recorded and evaluated in accordance with all applicable laws and regulations. Under this alternative, the Refuge Complex would continue to seek the funding necessary to complete the required site evaluation and cultural resource management plan for the Hercules Powder Company site.

Because undiscovered cultural resources may be present on the Refuge, any Refuge project that would result in the disturbance of the ground would require the completion of a cultural resource survey review and consultation with the SHPO, federally recognized Tribes, and interested parties. This requirement is applicable to all of the alternatives evaluated in the CCP.

### **Refuge Facilities**

The San Diego NWR Complex currently maintains a 1,500 square-foot Refuge office on Gunpowder Point (refer to Figure 2-1). The office is accessed via a gated road that extends from the terminus of E Street, near I-5, through undeveloped private land, and onto the Refuge. This roadway extends across Sweetwater Marsh on an improved road with two box culverts that facilitate tidal exchange between the bay and upper portion of the marsh.

Adequate parking for Refuge employees and Service vehicles is provided in a small, unpaved lot located across the primary access road to the east of the Refuge office.

Approximately ten vehicles can be accommodated in this lot. Limited additional parking is available immediately to the east of the Refuge office and about 50 yards to the south of the office.

### **Step-Down Management Plans**

Summarized below are two step-down management plans that have been prepared in association with the development of this CCP. The plans are presented in their entirety in the Appendices.

#### **Fire Management Plan**

The San Diego NWR Complex (Complex), consistent with the requirements of the National Fire Plan, has developed a fire management plan for all of the Refuges within the complex. The plan, which is provided as Appendix L, outlines the fire management objectives for the Complex, describes the Complex's wildland fire management situation, and presents the Complex's fire management strategies. With respect to Sweetwater Marsh Unit, the plan focuses on preparedness, wildland fire operations, prevention, and detection. Prescribed and wildlife fire use are not proposed as a strategy for achieving land management objectives on this Refuge.

Fire management plans prepared for Refuges are required to be consistent with firefighter and public safety, values to be protected, and natural and cultural resource management plans. These plans must also address public health issues. The Complex's draft fire management plan, which meets all of these requirements, also addresses potential wildland fire occurrences and includes a full range of wildland fire management actions, including containment, confinement, and control. The Wildland Urban Interface program under the National Fire Plan is used to fund hazard fuel reduction projects in areas where wild fire poses a risk to adjoining communities and refuge facilities. The Refuge staff developed, coordinated, and reviewed the draft plan to ensure consistency with the proposals included in the CCP for Sweetwater Marsh Unit. Once approved, the fire management plan will be supplemented by operational procedures such as a preparedness plan, preplanned dispatch plan, hazard fuel plan, and prevention plan.

Due to the on- and off-site values at risk on this Refuge, the fire management plan emphasizes prevention and suppression as the primary fire management tools. Fire prevention activities implemented on the Refuge occur in the vicinity of the D Street Fill and around the Refuge office on Gunpowder Point. Non-native vegetation growing along the eastern perimeter of the D Street Fill is periodically removed to reduce fuel levels. This activity is particularly important because of the ongoing risk of wildfires associated with illegal campfires started by vagrants in the area. The vegetation occurring immediately adjacent to the Refuge Office is also routinely pruned and thinned for structural protection.

#### **Predator Management Plan**

Predator management would continue to be implemented on the Sweetwater Marsh Unit pursuant to the Service's endangered species management responsibilities and in conjunction with other wildlife and habitat management activities provided adequate funding is available to cover the costs of this program. Currently, predator management on the D Street Fill is the joint responsibility of the Service and the Port, while predator management on the remainder of the Sweetwater Marsh Unit is the sole responsibility of the Service. Beginning in 2007 or 2008, depending upon when the National City Marina is opened, the Port will become responsible for all predator management activities occurring

on the D Street Fill and within Paradise Marsh between March 1 and September 15 of each year. This responsibility will continue for the life of the marina.

Predator management is necessary because predation has been identified as a serious limiting factor to the reproductive success of several federally listed species that nest on the Sweetwater Marsh Unit, including the endangered California least tern and light-footed clapper rail and the threatened western snowy plover. Predator management is implemented as part of an integrated wildlife damage control program that emphasizes non-lethal measures such as vegetation management, trash clean-up, the use of fencing and exclosures, and predator hazing or trapping and relocation, but also includes lethal removal of mammal predators. In addition, lethal removal of individual problem avian predators may be implemented when non-lethal measures prove to be ineffective. Predator management is one of several strategies implemented to protect from further decline the federally listed species found on the Refuge. The San Diego NWR Complex currently contracts with U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service, Wildlife Services (APHIS – WS) to accomplish predator management on the Refuge. APHIS – WS also conducts the Port's predator management program.

An important component of the Refuge's integrated predator management program is annual monitoring of least terns, snowy plovers, and light-footed clapper rails to determine hatch and fledge rates for terns and plovers, as well as adult breeding population size for all three species. In addition, tern and plover nesting areas and clapper rail habitat are monitored for the presence of avian and mammalian predators. Information recorded during monitoring includes predator species observed, particular behaviors and habits of an individual or group of predators, and evidence of predation on tern, plover, or rail adults, eggs, chicks, or fledglings.

The procedures for controlling predator species are dependent upon several factors, including but not limited to the degree of threat to endangered species populations, native or non-native status of the predator, the conservation status of specific predator species populations, and the condition of protected species nesting colonies. Based on these protocols, it has been determined that the following species are subject to control: domestic dog (*Canus familiarus*), domestic cat (*Felis domesticus*), feral dog, feral cat, coyote (*Canus latrans*), red fox (*Vulpes vulpes*), gray fox (*Urocyon cinereoargenteus*), California ground squirrel (*Spermophilus beecheyi*), Virginia opossum (*Didelphis virginiana*), striped skunk (*Mephitis mephitis*), raccoon (*Procyon lotor*), Norway rat (*Rattus norvegicus*), black rat (*Rattus rattus*), American crow (*Corvus brachyrhynchos*), common raven (*Corvus corax*), and injured gull species. In addition, individuals of the following native avian species could be live-trapped, or in some cases lethally removed, if an individual bird poses a threat to endangered species: American kestrel (*Falco sparverius*), loggerhead shrike (*Lanius ludovicianus*), barn owl (*Tyto alba*), great horned owl (*Bubo virginianus*), burrowing owl (*Speotyto cunicularia hypugaea*), short-eared owl (*Asio flammeus*), red-tailed hawk (*Buteo jamaicensis*), northern harrier (*Circus cyaneus*), peregrine falcon (*Falco peregrinus*), and some gull species. The presence of these native species within the Refuge is desirable, as they contribute to the Refuge's avian diversity, however, intervention to address specific problem individuals may be required to ensure the recovery of those species threatened with extinction.

The predator management plan emphasizes the use of non-lethal control measures whenever possible and the majority of the control actions occur during the endangered species nesting season. During the rest of the year, predator management focuses on the

control of feral dogs and cats and other mammalian predators that pose a threat to the endangered light-footed clapper rail, which is a permanent resident of the Refuge's coastal marsh habitat.

Some problem predators are live trapped and removed from the area. Live captured raptors and other avian predators that have been determined to pose a threat to listed species would be removed and held in a licensed/permitted rehabilitation or holding center until they can be released back into the wild. Release of these predators occurs at a suitable location after the endangered species nesting season is completed. Release site locations would be left to the discretion of the Refuge Manager. Prior to release, these predators would be banded with USFWS permanent leg bands.

Hazing might also be used to discourage predators from entering endangered species nesting areas. Lethal control would be implemented when non-lethal control proves ineffective and an individual problem predator is identified that poses an immediate threat to a listed species.

All domestic or feral dogs and cats, when feasible, would be taken to an approved shelter facility operated by a cooperating local unit of government, humane society, or a veterinary care facility. Any non-target wildlife (an animal determined not to be a threat to listed species) that is captured unharmed would be immediately released near the capture site or at a suitable location.

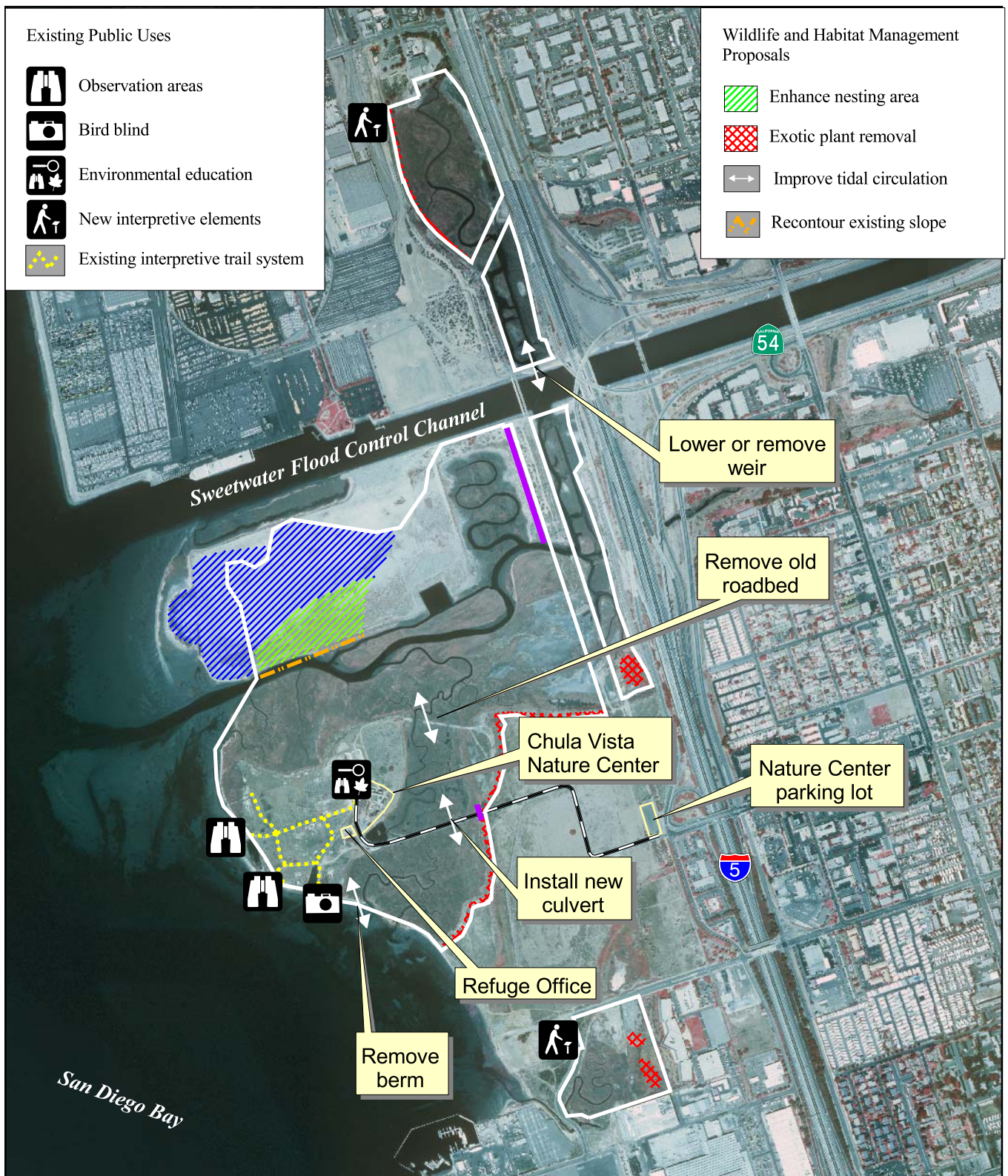
Specific control methods would be conducted in accordance with Federal and State regulations and are discussed in detail in the draft predator management plan provided in Appendix M.

### **2.2.2.2 Alternative B – Implement Habitat Enhancement**

Under this alternative (Figure 2-3), management activities would focus on enhancing the Refuge's coastal salt marsh habitat for the benefit of a variety of wildlife species. Only a fraction of the salt marsh habitat that once existed within San Diego Bay still remains today, and the majority of that habitat is located within the Sweetwater Marsh Unit. It is essential that the biological diversity and environmental health of this habitat be maintained and, where appropriate, enhanced for the fish, resident or migratory wildlife, and plant species, that depend on this salt marsh habitat for survival. Improving the habitat value of the Refuge's coastal salt marsh habitat is crucial to the recovery of several federally listed endangered species, including the light-footed clapper rail and salt marsh bird's beak. Improving the habitat quality of Southern California's coastal wetlands is also a conservation priority of the Southern Pacific Shorebird Conservation Plan (*Hickey et al. 2003*).

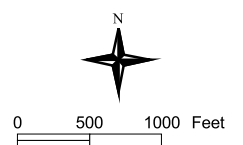
In addition to the activities described under Alternative A, this alternative also includes proposals to enhance tidal circulation and improve marsh management, as well as a proposal to partner with adjacent cities in the development of interpretive elements for Paradise Marsh and the F&G Street Marsh. Full implementation of this alternative would require funding to construct the proposed circulation improvements and to design, construct, and install interpretive signs or other interpretive elements (refer to Appendix D).





**Figure 2-3 Sweetwater Marsh Unit, Alternative B**

- Refuge boundary
- Access road
- Gate/Fencing
- Jointly managed least tern nesting site



Source: USFWS, Local Agency Partnership 2000 (2 ft imagery)

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**Wildlife and Habitat Management****Endangered and Threatened Species and Other Species of Concern**

In addition to the management activities described under Alternative A, the following additional activities would be implemented under Alternative B:

- Complete an inventory of the species present within the marsh complex and map the distribution and estimate the size of all populations of special status species in the marsh;
- Monitor sensitive plant populations to track changes in plant distribution and abundance, as well as changes in overall habitat quality;
- Identify locations in the marsh complex where appropriate conditions exist or could be provided to support salt marsh bird's beak;
- Develop protocols as part of a step-down HMP to reestablish salt marsh bird's beak in suitable locations within the marsh complex;
- Remove invasive plants throughout the Refuge Unit, as illustrated in Figure 2-3, placing particular emphasis on the removal of invasive plants in high marsh areas in order to create openings for seedling recruitment of salt marsh bird's beak and other native high marsh plant species;
- Improve signage and install fencing, where necessary, to minimize incidents of trespass into the marsh habitat to protect sensitive wildlife and plant species; and
- Increase tidal and seasonal freshwater circulation throughout the marsh complex, as described in greater detail in the Habitat Enhancement section.

**Habitat Protection**

Expanded Protection of the Refuge's Trust Resources: A public outreach program that increases understanding of and adherence to Refuge regulations is an important management tool for protecting the wetland and upland habitats of urban Refuges like the Sweetwater Marsh Unit. Under this alternative, a public outreach program would be developed and implemented that focuses on reducing the current levels of unauthorized access onto the Refuge. These would be achieved through improved signage along the Refuge boundary, greater numbers of public contacts by Refuge law enforcement, routine visits by Refuge staff to the more remote areas of the Refuge, and a broad based information campaign utilizing Refuge staff, our Friends group, and the media. If and when the open lands located immediately adjacent to this Unit are developed, the public outreach program would likely be expanded to address the potential increases in unauthorized entry onto Refuge lands, the presence of uncontrolled cats and dogs within the Refuge, and illegal dumping and littering within the Refuge boundaries. Should unauthorized access onto this Unit become significant, additional signage and/or fencing would be installed in appropriate locations to discourage such activities and public outreach would be expanded to more effectively reach the surrounding public.

Increased Involvement in Regional Planning Issues: The habitat quality of the wetland resources within the Refuge Unit is influenced to some extent by factors outside the control of the Service. Degraded water and air quality, night lighting, and excessive noise

levels generated from areas located outside of the Refuge can adversely affect Refuge resources. To reduce the potential for such adverse effects, the Service would increase its participation in local and regional planning efforts. Involvement in watershed planning, the development of regional growth management strategies, local development advisory committees, and other resource and development related planning activities would provide Refuge staff with opportunities to assist in developing policies that would minimize the effects of outside influences on Refuge resources.

### **Habitat Enhancement**

This alternative proposes several habitat enhancement projects intended to increase habitat values for a variety of species, particularly the Refuge's federally listed species, and several Birds of Conservation Concern, including the whimbrel (*Numenius phaeopus*), long-billed curlew (*Numenius americanus*), marbled godwit (*Limosa fedoa*), and black skimmer (*Rynchops niger*). These enhancement projects are described below and the location of each project is illustrated in Figure 2-3. The details of how and when these proposals would be implemented would be further defined in a future step-down HMP.

- Historic tidal channels in Sweetwater Marsh (channels that were blocked when fill was placed in the marsh to provide access to Gunpowder Point) would be reconnected to increase tidal circulation over approximately 60 to 80 acres of the main marsh complex, as well as to promote the expansion of cordgrass and improve overall habitat quality for the light-footed clapper rail. Specific actions include:
  - Removing some or all of the abandoned roadbed that currently separates the north and south ends of Sweetwater Marsh to reestablish old tidal channels in the eastern end of the marsh;
  - Installing an additional box culvert under the main access road to Gunpowder Point in an area where the road currently blocks a historic tidal channel; and
  - Removing an old berm constructed between the bay and the southern tip of Sweetwater Marsh if hydrological studies indicate that the tidal exchange in the back part of the marsh would benefit from this action.
- Portions of the D Street Fill would be enhanced to improve the suitability of the area for nesting least terns and snowy plovers. Specific actions would include:
  - Enhancing approximately 15 acres in the southwestern end of the D Street Fill to improve nesting conditions for least terns and snowy plovers by capping the area with six to eight inches of appropriate nesting substrate (sand and seashell fragments);
  - Removing all large perennials and shrubs that occur around the perimeter of the nesting area to reduce perching opportunities for avian predators and to eliminate cover for mammalian predators; and
  - Improving signage and installing fencing, where necessary, to minimize incidents of human and mammalian disturbance within the nesting area.
- A hydrological analysis would be conducted to determine the optimum design and weir height (if any) for the terminus of Paradise Creek, where it empties into the

Sweetwater flood control channel. Based on this information, the existing weir in this location would be lowered or removed to facilitate proper tidal flushing and natural channel maintenance in Paradise Marsh.

### **Public Use Program**

The uses currently occurring on Gunpowder Point, as described under Alternative A, would continue under this alternative. In addition, Refuge staff would seek to partner with National City and Chula Vista in the development of interpretive elements that could be accommodated within the public right-of-way adjacent to Paradise Marsh and F&G Street Marsh. There may also be an additional opportunity for interpretation on a proposed public trail to be installed on the bluff that overlooks Paradise Marsh.

### **Environmental Contaminants Investigations**

Under this alternative, funding would be sought to implement the recommendations included in the CAP (refer to Alternative A).

### **Cultural Resource Management**

Under this alternative, Refuge staff would continue to implement cultural resource management practices that are consistent with the requirements of the National Historic Preservation Act (NHPA). In addition, this alternative proposes to expand the Unit's existing interpretive program to include interpretation of the cultural history of the area, as well as the historic industrial uses that occurred on the site. These aspects of the interpretive program would be developed in partnership with federally recognized Tribes and other interested parties, including historical societies and museums. Finally, a Memorandum of Understanding (MOU) between the Service and the Tribes would be created and utilized to implement the inadvertent discovery clause of the Native American Graves Protection and Repatriation Act (NAGPRA). The MOU would address the process for identifying Native American Tribes, Groups, and direct lineal descendants that may be affiliated with the Refuge lands; initiating consultation with affiliated Tribes, Groups, and direct lineal descendants; developing procedures to follow for intentional and inadvertent discoveries; and identifying the persons to contact for the purposes of NAGPRA.

### **Step-Down Management Plans**

#### **Fire Management Plan**

All aspects of the fire management plan, as described in Alternative A, would also be implemented under this alternative.

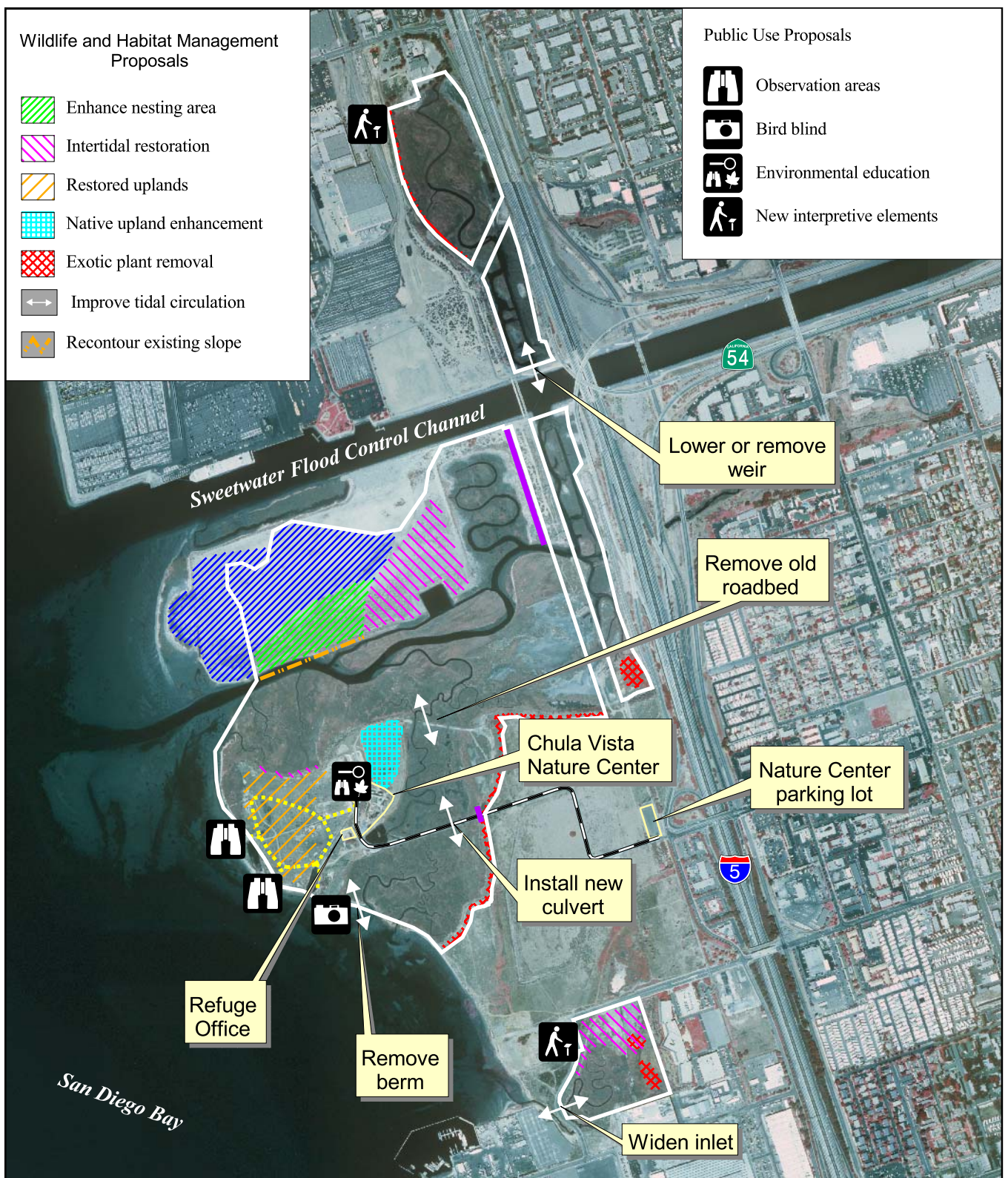
#### **Predator Management Plan**

Predator management, as described in Alternative A, would also be implemented under this alternative.

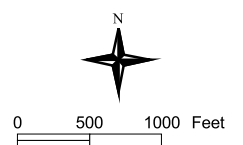
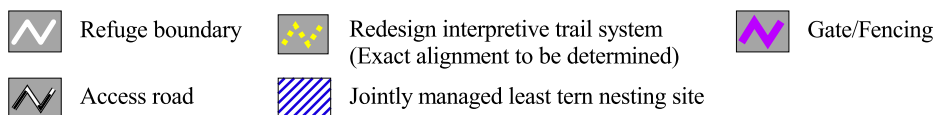
### **2.2.2.3 Alternative C – Preferred Alternative: Implement Habitat Enhancement and Restoration and Improve Existing Public Uses**

Under Alternative C (Figure 2-4), various restoration projects are proposed that would increase the total acreage and habitat quality of the salt marsh habitat on the Sweetwater Marsh Unit. In addition, native upland habitat would be restored on Gunpowder Point. This alternative also includes proposals for improving existing opportunities for wildlife observation, photography, environmental education, and interpretation. Full implementation of this alternative would require funding to implement the various habitat and public use proposals (refer to Appendix D).





**Figure 2-4 Sweetwater Marsh Unit, Alternative C**



Source: USFWS, Local Agency Partnership 2000 (2 ft imagery)

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Restoring degraded areas within this Refuge Unit to habitats more reflective of historic conditions would implement recovery actions included in the California Least Tern Recovery Plan (*USFWS 1985a*), Salt Marsh Bird's Beak Recovery Plan (*USFWS 1985b*), Light-footed Clapper Rail Recovery Plan (*USFWS 1985c*), and Western Snowy Plover Pacific Coast Population Draft Recovery Plan (*USFWS 2001*). These restoration proposals would also implement some of the recommended actions for the conservation of shorebird populations in the South Pacific Region, as described in the Southern Pacific Shorebird Conservation Plan (*Hickey et al. 2003*).

### **Wildlife and Habitat Management**

#### **Endangered and Threatened Species and Other Species of Concern**

Management activities intended to support the Refuge's endangered and threatened species, as well as Birds of Conservation Concern, are described under Alternative B. Under this alternative, these activities would be expanded to include increased management within the marsh complex, while also restoring upland and wetland habitat. These proposals include:

- Seeking funding and/or partners to study the effects of recent sediment accumulation on the long term viability of cordgrass habitat within the marsh complex and identifying measures for improving the suitability (i.e. increasing the coverage and stem height of cordgrass) of the existing salt marsh for the light-footed clapper rails;
- Identifying appropriate areas for improving habitat quality for salt marsh bird's beak colonization; and
- Restoring coastal sage scrub and maritime succulent scrub habitat on Gunpowder Point, which could provide suitable nesting habitat for the federally listed threatened California gnatcatcher (*Poliophtila californica californica*), as well as improve habitat quality for native pollinators important to the Refuge's salt marsh bird's beak population; and restoring coastal salt marsh habitat to improve nesting and/or foraging habitat for several of the Refuge's listed bird species and other Birds of Conservation Concern (additional details regarding these restoration proposals are provided below under Habitat Restoration).

#### **Habitat Management**

The habitat management and protection proposals described in Alternatives A and B would also be implemented under this alternative. In addition, new and/or expanded maintenance and monitoring activities would be implemented for the first few years following restoration. These activities would include monitoring plant establishment in restored salt marsh habitat and controlling invasive plant species in restored areas. The costs and long-term staffing needs associated with these activities are addressed in Appendix D.

#### **Habitat Restoration**

This alternative includes various proposals for restoring the disturbed portions of the Sweetwater Marsh Unit to native habitat, as indicated in Figure 2-4. The restoration proposals as presented here are preliminary in nature. Detailed restoration plans would be developed as part of a subsequent step-down HMP. Table 2-3 provides an overview of the types of habitats proposed for restoration under this alternative and identifies the specific areas proposed for restoration.

Table 2-3 Habitat Proposals Under Alternative C		
Location <sup>1</sup>	Proposed Habitats	Estimated Acreage
<u>Sweetwater Marsh, Marisma de Nacion, Connector Marsh</u>	<u>Protected intertidal wetlands</u>	<u>170 acres</u>
	Possible conversion of high marsh to low marsh habitat ( <u>Sweetwater Marsh</u> )	To be determined
<u>Paradise Marsh</u>	<u>Protected intertidal wetlands</u>	<u>36 acres</u>
D Street Fill	Restored intertidal wetlands	13.0 acres
	Preserved nesting habitat	33.0 acres
	<u>Protected existing fish habitat site</u>	<u>1.0 acre</u>
	<u>Upland habitat to remain for access and sensitive plant protection</u>	<u>8.5 acres</u>
Gunpowder Point	Restored native uplands (coastal sage scrub/maritime succulent scrub)	25.0 acres
	Restored Intertidal wetlands	2.0 acres
	<u>Chula Vista Nature Center/Refuge Office Sites</u>	<u>8.5 acres</u>
F&G Street Marsh	<u>Enhanced Intertidal Wetlands</u>	6.0 acres
	Restored <u>Intertidal Wetlands</u>	<u>13.0 acres</u>
<u>Total Acreage</u>		<u>316 acres</u>

<sup>1</sup>Refer to Figures 1-3 and 2-4.

Sweetwater Marsh: Sweetwater Marsh has experienced reduced tidal and freshwater flows and increased sedimentation. In some areas this has resulted in the replacement of cordgrass-dominated low marsh habitat, a habitat important to the successful reproduction of the light-footed clapper rail, with high marsh habitat dominated by pickleweed. To reverse this trend, this alternative proposes the tidal enhancements described in Alternative B. By improving tidal circulation, the accumulation of sediment within the marsh would be reduced and in some cases reversed, which would improve conditions for cordgrass-dominated salt marsh habitat.

D Street Fill: Approximately 13 acres at the eastern end of the D Street Fill would be restored to intertidal habitat, while 33 acres, including about 10 acres, proposed for salt marsh restoration under the existing MOU (refer to Section 2.2.2.1), would be preserved for seabird nesting for at least the next 15 years. Another six to seven acres in this area would be set aside to accommodate access for maintenance and monitoring of the seabird nesting area and two acres would remain undisturbed to protect sensitive upland plants that occur along the western edge of Marisma de Nacion (refer to Figure 2-4). The

sensitive plants to be protected include Nuttall's lotus, coast wooly-heads (*Nemacaulis denudata*), and beach evening primrose (*Camissonia cheiranthifolia suffruticosa*).

Under this alternative, the restored intertidal area on the D Street Fill would be designed to include a mix of habitat types including tidal flats and subtidal areas. These habitats would provide foraging opportunities in proximity to tern and plover nest sites, and access to tidal flats from the adjacent nesting area would be designed and maintained to accommodate snowy plover foraging. Within the proposed nesting area, the substrate and other enhancements (fencing, signage, weed control) described in Alternative B would also be implemented under this alternative. All intertidal restoration would be designed with the intent of supporting the adjacent nesting terns and plovers.

Gunpowder Point: Both upland and wetland restoration are proposed for portions of Gunpowder Point (refer to Figure 2-4).

From about 1916 to 1988, the majority of Gunpowder Point was subject to significant human disturbance. First occupied for industrial purposes and later the site of a large agricultural operation, Gunpowder Point now supports vegetation characteristic of disturbed upland areas in coastal San Diego County. Based on the species composition of the small remnants of native upland vegetation that still exist on the site, it is likely that maritime succulent scrub once dominated portions of Gunpowder Point. Today, opportunistic native species representative of coastal sage scrub vegetation can be found lightly scattered throughout the more central portions of the site. These conditions indicate that Gunpowder Point would be appropriate for restoring areas of both coastal sage scrub and maritime succulent shrub habitat. Approximately 25 acres of disturbed habitat are available for such restoration.

The restoration of approximately two acres of coastal salt marsh is proposed along the northwestern edge of Gunpowder Point. The primary objective of this restoration proposal is to remove fill from the edge of the marsh that was placed there as a result of previous farming activities.

F&G Street Marsh: The disturbed portions of the F&G Street Marsh (approximately six acres) would be restored to improve habitat quality and tidal circulation (refer to Figure 2-4). This restoration proposal would involve the removal of uncompacted fill material located at the northeastern end of the marsh and along the east side of Marina Parkway. The proposed excavation would increase the tidal prism within the marsh, as well as provide appropriate elevations to support intertidal habitat. Following removal of the fill material, the restoration area would be contoured to produce a gradual change in elevation to support a range of intertidal habitats. Prior to implementing this proposal, it would be necessary to conduct a contaminants analysis to determine if contaminants are present and to identify appropriate methods for removing and disposing of contaminated materials excavated from this site.

Increasing the tidal prism within the F&G Street Marsh would improve tidal circulation to some extent; however, additional measures are required to improve the long-term wetland functionality of the marsh. Such measures include widening the existing tidal channel that connects F&G Street Marsh to San Diego Bay and replacing the existing undersized culverts in Marina Parkway with an open span bridge. Both of these proposals would involve improvements to properties located outside the boundaries of the Refuge;

therefore, their implementation would require cooperation between the Port, the City of Chula Vista, and the Service.

Paradise Marsh: The Service will continue to work with National City in their efforts to implement the National City Local Coastal Plan, which proposes restoration of native uplands adjacent to Paradise Marsh.

Note: The restoration proposals included in Alternative C address many of the areas currently encumbered by mitigation leasehold overlays, as described in Alternative A (refer to Section 2.2.2.1). Following the established of these overlays by the Court, the leaseholder and the Service entered into an MOU that specified the acreages, areas, and habitat types to be targeted for restoration within the overlays. Some of the restoration proposals described in Alternative C differ from those agreed upon in the MOU. Until the MOU expires, the leaseholder retains the authority to restore (following approval of the restoration plans by the Service), or sell mitigation credits to a third party who would restore, those areas included within the overlays in accordance with the MOU. Therefore, habitat restoration within the leasehold overlays cannot be initiated by the Service until the MOU either expires or is revised. Once the MOU expires in 2010, the Service would be free to restore any areas that have not been restored under the terms of the MOU. Although the Service may have to wait to implement restoration until the MOU expires, it still retains review authority of any leaseholder initiated restoration proposals to ensure that the terms of the MOU are met by the proposed restoration action.

### **Public Use Program**

#### **Wildlife-Dependent Recreational Uses**

Under Alternative C, the existing opportunities for wildlife-dependent recreational uses on the Sweetwater Marsh Unit would be improved and in some cases expanded. These uses include wildlife observation, photography, environmental education, and interpretation. No new public uses are proposed. As described in Alternative A, general public access onto the Refuge would continue to be restricted to Gunpowder Point. Visual access into other portions of the Refuge Unit, such as Paradise Marsh and F&G Street Marsh would be available from the existing public right-of-way. These areas provide opportunities for expanding the Refuge's current environmental interpretation program.

Wildlife Observation and Photography: Opportunities for wildlife observation and photography are available to the public via the existing trail system (refer to Alternative A). Under this alternative, the trail system would be redesigned to improve the quality of the observation opportunities on the Refuge (more details are presented below under Environmental Education and Interpretation).

In response to comments received during the public scoping process this alternative also includes a proposal to coordinate with adjacent municipalities (National City and Chula Vista) to develop opportunities for wildlife observation within the public rights-of-way that abut Paradise Marsh and the F&G Street Marsh (refer to Figure 2-4). No upland area is available on Refuge property to accommodate these observation areas; therefore, opportunities for observation points could only be provided from the existing sidewalk or roadway that adjoins Refuge property.

Environmental Education and Interpretation: The environmental education programs described in Alternative A would continue under this alternative. In addition, the Service would partner with other agencies and institutions in the region to support the creation of

and identify funding for a South Bay environmental education facilitator. This facilitator would be responsible for contacting school districts about the many field experience curricula available in the South Bay, including those on the Sweetwater Marsh Unit. This facilitator would also be responsible for developing a region-wide strategy for filling teacher workshops; soliciting transportation grants to be used by each program; and developing teacher in-service agreements with local school districts to more efficiently reach the greatest number of educators. The creation of such a position would enhance the outreach efforts of all existing environmental education programs in the South Bay, including the Sweetwater Safari and other programs implemented on this Refuge Unit.

There are a variety of opportunities available on Gunpowder Point for environmental interpretation (refer to Alternative A). Under this alternative, these opportunities would be maintained, and in some cases enhanced, to better serve Refuge visitors. Specifically, many of the interpretive panels provided along the half-mile trail system on Gunpowder Point (refer to Figure 2-4) need to be refurbished or replaced. In addition, the current alignment of the trail system does not adequately meet the needs of the Refuge's existing education and interpretation programs. To address this issue, this alternative includes a proposal to realign the trail system and redesign the existing interpretive elements provided along the trail.

The interpretive trail planning effort would involve evaluation of the existing trail system to determine where realignment of the trail would improve the quality of the trail experience, improve overall accessibility, and reduce potential impacts to adjacent sensitive habitats. Where possible, the trail would be designed to loop around an area, rather than bring a visitor out to the edge of a habitat and then terminate. The proposed realignments could involve the closure of some trail segments and/or the creation of one or more new segments. Although the redesigned trail system would be created primarily to facilitate environmental education and interpretive programs, it would also improve opportunities for wildlife observation and photography on Gunpowder Point. The redesign trail system would also be expected to reduce impacts to sensitive habitat areas by reducing the incidence of unauthorized off-trail activity. The specific details of these proposals would be developed as part of a step-down interpretive trail plan.

The step-down interpretive trail plan would also include proposals for new interpretive elements along the trail. This interpretation would be designed to complement existing educational programs, while also presenting a range of Refuge-related material for other visitors. The step-plan would include project designs, cost estimates for creating the various interpretive elements and redesigning the trail system, and appropriate locations for installing the interpretation along the redesigned trail. Once completed, funding would be sought to implement the plan. Implementation could occur in one phase or in various phases depending upon the availability of funds.

The proposal described in Alternative B to partner with National City and Chula Vista in the development of interpretive elements for the public right-of-way located adjacent to Paradise Marsh and F&G Street Marsh would also be implemented under this alternative.

### **Environmental Contaminants Investigations**

Similar to Alternative B, this alternative proposes to seek the funding necessary to implement the recommendations presented in the CAP.



### **Cultural Resource Management**

Cultural resource management under this alternative would be the same as described under Alternative B.

### **Step-Down Management Plans**

#### **Fire Management Plan**

All aspects of the fire management plan, as described in Alternative A, would also be implemented under this alternative.

#### **Predator Management Plan**

Predator management, as described in Alternative A, would also be implemented under this alternative.

## **2.2.3 Alternatives Considered but Eliminated from Detailed Study**

The alternatives development process is designed to allow consideration of the widest possible range of issues and potential management approaches. During this process, a variety of strategies for implementing Refuge objectives were considered. Some were eliminated because their implementation would have conflicted with other Refuge objectives. Similarly, several management actions were considered but rejected because they were either infeasible or failed to achieve Refuge objectives. Presented below are those alternatives that were considered but not selected for detailed study.

### **2.2.3.1 Expand the Refuge Boundary to Incorporate Adjacent Mudflats**

During the public scoping meetings, several individuals expressed a desire to see the Refuge boundary expanded to the west to incorporate the intertidal mudflats that currently border the Sweetwater Marsh Unit. Although this area is presently managed by the Port for conservation purposes in accordance with the Port Master Plan (*SDUPD 1998*), there was a feeling among some members of the public that the long-term preservation of this habitat would be better assured if the habitat was incorporated into the National Wildlife Refuge System.

The lands suggested for Refuge expansion are public trust lands held by the Port, with oversight from the California State Lands Commission, for the benefit of the people of California. Should this area be incorporated into the Refuge boundary, these public trust lands would not be transferred to federal ownership per California's Public Trust Policy. The CCP team reviewed this proposal and determined that expansion of the Refuge is not required to protect the habitats already included within the Refuge. In addition, these mudflats, which are already managed for habitat by the Port, would not receive any greater protection and management if they were to be incorporated into the Refuge. Based on the results of this review, a proposal to expand the Refuge boundary was not incorporated into one of the management alternatives for further review and analysis. The Service may determine at some future date that circumstances have changed and expansion of the Refuge boundary would benefit Refuge resources and/or the adjacent mudflats.

There is also an opportunity for the Service to enter into a cooperative agreement with the Port that would ensure the long-term protection of this area without the need to incorporate the area into the Refuge boundary. This opportunity is the result of an action taken by the Port in August 2001, when the Port Master Plan was amended to change the land use for the South Bay Boat Yard (a parcel located to the south of the Sweetwater Marsh Unit). As required in the Final Mitigated Negative Declaration for this project, the Master Plan Amendment includes the following condition: "... the Port District would enter into a cooperative agreement with an appropriate agency or organization which would be designated to protect and/or enhance, where appropriate,

the sensitive biological wetland habitat (i.e., mudflats) running north from the South Bay Boat Yard site to the Sweetwater River Channel.” To implement this condition, in November 2002 the Port wrote to the Service requesting direction regarding our interest in being a party to a cooperative agreement that would ensure the long-term management and protection of the adjacent mudflats. Discussions between the Port and the Service about this request are ongoing.

### **2.2.3.2 Open the Refuge to Recreational Fishing**

During the CCP process, the planning team evaluated the potential for opening the Sweetwater Marsh Unit to recreational fishing, as it is one of the six priority public uses of the NWRS. Following an analysis of the physical and biological conditions within this Refuge Unit, it was determined that access for shoreline fishing along the Unit’s tidal channels could not be provided without substantial degradation of sensitive wetland habitat. Even if fishing were to be permitted from non-motorized boats, the quality of the fishing experience in these areas would be limited because of the minimal size, depth, and availability of open water within the tidal channels.

As indicated in Figure 1-3, this Unit has almost no shoreline access along the bay. The land between the bay and open water is controlled by the Port. This is also true for the Sweetwater flood control channel. The small area of Refuge that does abut the bay at the southern end of Gunpowder Point is separated from the open waters of the bay by extensive areas of intertidal mudflats, which are managed by the Port.

Shoreline fishing is available in the immediate vicinity of the Refuge. Public fishing piers are provided to the north of the Refuge near Pepper Park in National City and to the south near the Chula Vista Marina in Chula Vista (refer to Section 3.6.4.2 and Figure 3-21 for more information). In addition, the bay is open to fishing year round.

The importance of the marsh habitat within the Sweetwater Marsh Unit to listed species was also considered in making this determination. The Sweetwater Marsh Unit protects one of the last remaining coastal salt marshes within San Diego Bay. This marsh habitat and its associated tidal channels provide regionally significant habitat for migratory shorebirds and is one of only a few places in San Diego County with suitable habitat for the federally-listed endangered light-footed clapper rail. Although some human disturbance in the main channel might be tolerated by the rail, the act of fishing would result in prolonged disturbance within the channel, which could diminish the habitat value of the tidal channel for the rail and various migratory birds.

After considering all of the issues outlined above, and taking into the consideration the other opportunities for fishing in San Diego Bay, the proposal to include recreational fishing on this Refuge Unit was eliminated from detailed study. For additional discussion, refer to the Compatibility Determination for Fishing on the Sweetwater Marsh Unit, provided in Appendix K.

### **2.2.3.3 Develop a Non-Motorized Boat Trail in Sweetwater Marsh**

Development of a seasonal water trail (a designated route through the tidal channels within the marsh for non-motorized paddle-type vessels) was considered but not included as an alternative component. This proposal would have opened a limited portion of the Sweetwater Marsh Unit to non-motorized, paddle-type vessels, such as kayaks and canoes, by establishing a seasonal (non-nesting season) kayak/canoe trail. Although recreational boating is not one of the six priority public uses of the NWRS, the water trail could have provided an opportunity for wildlife observation, as well as recreational boating. This public use component was not included within one of the three management alternatives for reasons related to species sensitivity and feasibility.

The Sweetwater Marsh Unit supports four federally-listed species that occur in proximity to the tidal channels that would accommodate this use. Of particular concern was the potential for increased human disturbance within the primary foraging areas of the light-footed clapper rail and western snowy plover. Other concerns related to potential landing of vessels along the high marsh areas that abut the channels. Such activity would result in trampling of sensitive plants, including salt marsh bird's beak, and would increase disturbance to light-footed clapper rails.

Feasibility issues included staffing limitations that would have made enforcement of the seasonal and non-motorized restrictions difficult and constraints associated with posting signs in the marsh to identify the approved route, as well as closed areas. Tidal conditions within the marsh also posed a potential safety issue as inexperienced paddlers could become stranded in the marsh during periods of low tide. A more detailed discussion of compatibility is provided in Appendix K, Compatibility Determination for Recreational Boating on the Sweetwater Marsh Unit.

#### **2.2.3.4 Alternative Predator Management Proposals**

Several alternative methods for addressing predation of listed species occurring with the San Diego Bay NWR were considered, but eliminated from detailed study. These methods, which are described below, included using only non-lethal measures for controlling predators (e.g., hazing, trapping); implementing only indirect controls, such as fencing nesting areas, installing anti-perching devices on posts and fences, and placing exclosures over nests, to reduce predator access to listed species; and implementing no predator management.

**Non-lethal Control Only.** Predator management that relies on the control of all predators using only non-lethal methods could have devastating effects on the Refuge's least tern and snowy plover populations. This is particularly true in situations in which an avian predator learns to prey on the eggs or young of a listed species. Past experience has demonstrated that once an individual predator successfully begins to forage within a least tern or snowy plover nesting colony, significant losses to the colony can occur before the individual is successfully trapped or otherwise discouraged from returning to the colony. In the case of predation of breeding adults, the losses have an even greater effect on productivity since losses of breeding adults can have adverse effects on least tern or snowy plover populations for many seasons. Without the option to implement lethal control when deemed necessary to protect listed species, it may not be possible to achieve the Refuge goals and objectives for the San Diego Bay NWR that relate to the protection of endangered and threatened species.

**Indirect Control Only.** Indirect control of predation would involve implementing management activities that reduce predation without lethal or non-lethal removal of predators. Instead, measures such as the use of visual and auditory repellents and physical barriers would be employed. Visual and auditory repellants are limited by several factors, including: 1) unintentional hazing of protected species while attempting to haze predatory species; 2) reduced effectiveness over time as some predatory species become accustomed to particular stimuli and begin to ignore them; 3) difficulties in effectively deploying such repellents in the field; and 4) limited effectiveness of repellents on particular species.

Physical barriers are a part of an integrated predator management program and would be implemented under the current predator management proposal, which should reduce the need for control of some mammals including unleashed and feral dogs. However, physical barriers in the absence of the ability to remove a predator are ineffective in controlling avian predation, as well as some mammalian predation. The use of exclosures over nesting plovers has been effective in protecting eggs, but once the chicks leave the exclosure, they are once again vulnerable to

predation. Although predation could be reduced to some extent through indirect control, the potential for loss, particularly from avian predators (refer to the discussion provided under Non-lethal Control Only) would remain high, therefore, this form of control is not considered adequate to achieve the goals and objectives of the Refuge for listed species.

**No Predator Management.** By taking no actions related to predator management, mammalian and avian predators would not be harassed or specifically deterred from traveling or flying through the Refuge or entering the nesting colonies. Based on previously documented losses of listed species to predation, it is likely that the Refuge's population of least terns, snowy plovers, and light-footed clapper rails would no longer be able to achieve sustainability goals for fledging success. In addition, a dramatic reduction in nest productivity could cause least terns and snowy plovers to abandon the existing nesting areas on the Refuge. A management strategy that excludes any form of predator management would place the viability of the Refuge's listed species at risk and would likely make it impossible to achieve the Refuge's endangered species goal.

## **2.2.4 Comparison of Alternatives by Issue**

Table 2-4 presents an issue-by-issue comparison of the three management alternatives for the Sweetwater Marsh Unit that were selected for detailed analysis.

## **2.2.5 Refuge Management Direction: Goals, Objectives, and Strategies**

### **2.2.5.1 Overview**

Goals and objectives are the unifying element of Refuge management, intended to identify and focus management priorities and to provide a link between management actions, Refuge purposes, and NWRS mission and goals. The goals for the Sweetwater Marsh Unit, as presented in Section 1.8.2.1, apply to all of the alternatives presented for the Refuge in the Draft CCP/EIS.

**Goals** are defined as descriptive, open-ended, and often broad statements of desired future conditions. **Objectives** are concise statements of what will be achieved to meet a particular goal. When possible, Refuge objectives should be specific, measurable, achievable, and result-oriented. In addition, objectives should be time-fixed within the 15-year life span of the CCP. Objectives derive from goals and provide the basis for determining strategies and monitoring Refuge accomplishments. **Refuge strategies** describe specific actions, tools, and techniques that can be used to meet Refuge objectives. In some cases, strategies describe specific projects in enough detail to assess funding and staffing needs. In other cases, further site-specific detail is required to implement a strategy. This additional detail takes the form of a step-down management plan, restoration plan, or site plan.

Although the goals are the same for each of the three alternatives described for the Sweetwater Marsh Unit there are a variety of ways in which to achieve these goals. Therefore, the objectives and strategies for each goal vary among alternatives. The following section includes objective statements and associated strategies for each Refuge goal. The objectives have been written to address the Preferred Alternative (Alternative C). In addition, the various strategies that would implement the objective in whole or in part are provided in a table format that allows the reader to determine which strategies would be implemented under each alternative. Specific acreage figures, time frames, and other measurable elements presented in the objectives may change depending upon which alternative is finally selected for implementation.

Table 2-4 Comparison of Alternatives for the Sweetwater Marsh Unit by Issue			
	Alternative A	Alternative B	Alternative C – Preferred Alternative
Issue			
<b>Wildlife/Habitat Management</b>			
<b>Enhance habitat values throughout the Sweetwater Marsh Unit</b>	<ul style="list-style-type: none"> <li>Continue current control of invasive plants in upland areas</li> <li>Maintain current public access restrictions in sensitive habitat areas to reduce disturbance by only permitting public access on Gunpowder Point</li> <li>Continue to conduct marsh clean ups with various partners</li> </ul>	<ul style="list-style-type: none"> <li>Implement projects to improve tidal circulation in Paradise Marsh and Sweetwater Marsh</li> <li>Expand invasive plant control to high marsh area to improve habitat quality for salt marsh bird's beak</li> <li>Enhance 15 acres of nesting habitat on the D Street Fill for terns and plovers</li> </ul>	<ul style="list-style-type: none"> <li>Implement the proposals included in Alternative B, plus increase the area maintained for nesting seabirds and western snowy plovers by 10 acres to a total of 33 acres on the D Street Fill</li> </ul>
<b>Restore native habitat, particularly salt marsh habitat</b>	<ul style="list-style-type: none"> <li>No restoration proposed (some mitigation may occur per the MOU for the mitigation leasehold overlays)</li> </ul>	<ul style="list-style-type: none"> <li>No restoration proposed (some mitigation may occur per the MOU for the mitigation leasehold overlays)</li> </ul>	<ul style="list-style-type: none"> <li>Restore 25 acres of intertidal wetlands, emphasizing restoration of cordgrass-dominated salt marsh habitat</li> <li>Restore 20 acres of upland habitat (coastal sage scrub and maritime succulent scrub)</li> </ul>
<b>Expand current marsh management activities to benefit listed species and migratory shorebirds</b>	<ul style="list-style-type: none"> <li>Maintain current management practices</li> </ul>	<ul style="list-style-type: none"> <li>Improve fencing/signage to reduce disturbance and reestablish salt marsh bird's beak in upland transition areas</li> </ul>	<ul style="list-style-type: none"> <li>Implement the proposals included in Alternative B and expand management/monitoring to include all restored areas</li> </ul>
<b>Reduce disturbance from adjacent urban development</b>	<ul style="list-style-type: none"> <li>Maintain current enforcement and surveillance levels</li> </ul>	<ul style="list-style-type: none"> <li>Develop a public outreach program to reduce unauthorized access into marsh habitat</li> </ul>	<ul style="list-style-type: none"> <li>Same as Alternative B</li> </ul>



Table 2-4 (continued) Comparison of Alternatives for the Sweetwater Marsh Unit by Issue			
Issue	Alternative A	Alternative B	Alternative C – Preferred Alternative
<b>Wildlife/Habitat Management (continued)</b>			
<b>Address adverse effects of predation on listed species productivity levels</b>	<ul style="list-style-type: none"> <li>Implement a predator management plan to manage mammalian and avian predators at the D Street Fill to reduce losses of least tern and snowy plover adults, chicks, and eggs and in the marsh to protect light-footed clapper rails</li> </ul>	<ul style="list-style-type: none"> <li>Same as Alternative A</li> </ul>	<ul style="list-style-type: none"> <li>Same as Alternative A</li> </ul>
<b>Public Use</b>			
<b>Open the Refuge to fishing and boating</b>	<ul style="list-style-type: none"> <li>Maintain the current public use program which does not permit fishing or boating on the Refuge</li> </ul>	<ul style="list-style-type: none"> <li>Expanded public use program does not include opening the Refuge to fishing or boating</li> </ul>	<ul style="list-style-type: none"> <li>Same as Alternative B</li> </ul>
<b>Expand opportunities for wildlife observation and environmental education and interpretation</b>	<ul style="list-style-type: none"> <li>Maintain the current public use program which includes opportunities for wildlife observation, environmental education, and interpretation</li> </ul>	<ul style="list-style-type: none"> <li>Partner with local agencies to develop interpretive signage for Paradise Marsh and F&amp;G Street Marsh</li> </ul>	<ul style="list-style-type: none"> <li>Expand interpretation as described in Alternative B</li> </ul> <p>Resign the trail system and interpretive signage on Gunpowder Point to improve wildlife observation, expand biological and cultural resource interpretation, and complement the existing environmental education programs</p>
<b>Other Issues</b>			
<b>Expand Refuge boundary to include adjacent mudflats</b>	<ul style="list-style-type: none"> <li>Maintain current refuge boundary, but work with the Port to protect mudflat habitat for migratory birds</li> </ul>	<ul style="list-style-type: none"> <li>Maintain current refuge boundary, but work with the Port to protect mudflat habitat for migratory birds</li> </ul>	<ul style="list-style-type: none"> <li>Maintain current refuge boundary, but work with the Port to protect mudflat habitat for migratory birds</li> </ul>

### 2.2.5.2 Description of the Goals, Objectives and Strategies

The proposed objectives and strategies are listed below as they apply to each of the five Refuge goals.

**GOAL 1:** Protect, manage, enhance, and restore coastal wetland and upland habitats to benefit native fish, wildlife, and plant species within the Sweetwater Marsh Unit.

#### ***Objective 1.1: Enhance Tidal Circulation in the Marsh Complex***

*When funding is identified, implement four enhancement projects intended to improve tidal circulation throughout the marsh complex to benefit approximately 130 acres of the Refuge's coastal wetlands. Implementation may occur in phases depending upon the availability of funding.*

**Rationale:** Historically, a network of tidal channels connected the marshes of the Sweetwater wetlands complex, including Sweetwater Marsh and Paradise Marsh. Over the years, the hydrology within these channels has been severely altered as a result of upstream dam construction, construction of the Sweetwater flood control channel, and filling within the marsh to accommodate access roads. As a result, freshwater flows into the marsh and tidal flushing throughout the marsh have been reduced, which has led to sedimentation within some of the marsh's tidal channels. Reconnecting some of these historic channels would improve tidal flushing, stabilize nutrient flows, and reduce the potential of further sedimentation within the channels. Improved tidal flushing would also restore appropriate salinity, pH, and oxygen content in marsh sediments, which is expected to improve conditions for cordgrass propagation. Implementation of this objective is consistent with the recovery actions described for the Sweetwater Marsh in the Light-footed Clapper Rail Recovery Plan (*USFWS 1985c*).

Objective 1.1 - Enhance Tidal Circulation in the Marsh Complex			
<i>Comparison by Alternative</i>			
<i>Alternative</i>			<i>Strategy</i>
<i>A</i>	<i>B</i>	<i>C</i>	
	✓	✓	Remove the abandoned roadbed that currently restricts tidal circulation between the north and south ends of the marsh to reestablish historic connections between the marsh's main tidal creek and the southern end of Sweetwater Marsh.
	✓	✓	Construct an additional culvert in Gunpowder Point Drive to reestablish a historic tidal channel and improve tidal circulation from the bay to the southeastern half of Sweetwater Marsh.
	✓	✓	Analyze previous hydrological studies that examined the effects of the weir located between the Sweetwater flood control channel and Paradise Marsh on tidal circulation and, based on this analysis, either lower or remove the weir to reduce tidal muting and improve overall tidal circulation in Paradise Marsh.
	✓	✓	Conduct a hydrologic study to analyze the benefits of removing the berm at the southern tip of Sweetwater Marsh; if benefits would be realized, prepare and implement engineering plans for removing the berm to improve tidal circulation within this portion of the marsh.

**Objective 1.2: Restore Intertidal Wetlands**

When funding is identified, restore approximately 20 acres of intertidal wetlands. Within five years of restoration, a minimum of 10 acres would be restored to cordgrass-dominated salt marsh at a density of at least 100 stems per square meter ( $m^2$ ) with at least 90 stems/ $m^2$  reaching a height in excess of 60 centimeters (cm) and of this, at least 30 stems/ $m^2$  reaching >90 cm in height (Zedler 1993). The remaining 10 acres of intertidal wetland restoration would consist of tidal channels and a combination of intertidal mudflat and cordgrass- and pickleweed-dominated salt marsh habitat.

**Rationale:** Statewide, 80 percent of California's coastal wetlands have been converted to urban or agricultural use (USFWS 1999). This loss of coastal wetland habitat has led to a decline of several native species that are now federally listed as threatened or endangered. Coastal wetland losses have also altered the abundance and distribution of shorebirds within the region (Hickey et al. 2003). Approximately 88 percent of the historic salt marsh habitat within San Diego Bay has been lost to dredging or filling (U.S. Navy 2000). Of the salt marsh that remains, the majority is preserved within the Sweetwater Marsh Unit. However, even within the Refuge boundary, historic uses have resulted in the loss of some salt marsh habitat. These disturbed areas provide opportunities for restoration that will benefit a range of coastal species. The salt marsh restoration is consistent with the Service's Biological Integrity, Diversity, and Environmental Health Policy and would implement recovery actions and conservation recommendations for the Refuge's listed species and migratory shorebirds.

Objective 1.2 - Restore Intertidal Wetlands Comparison by Alternative			
Alternative			Strategy
A	B	C	
✓	✓	✓	Prior to March 2010, review and approve, as appropriate, restoration and/or enhancement plans proposed for up to 50 acres of intertidal wetlands within the mitigation leasehold overlays.
		✓	Restore approximately 13 acres of the eastern end of D Street Fill to intertidal wetlands, of which a minimum of 10 acres would be restored to cordgrass-dominated salt marsh habitat.
		✓	Restore approximately six acres of disturbed fill area within the F&G Street Marsh to an appropriated array of intertidal wetland habitats.
		✓	Remove fill along the northwestern edge of Gunpowder Point to restore approximately two acres of salt marsh habitat.
	✓	✓	Establish and implement a monitoring program for the restored areas to determine if and how the restoration objectives are being achieved; make any necessary modifications based on these results.
	✓	✓	Employ integrated pest management techniques to control and/or eradicate invasive plant species within the restoration area.
		✓	Initiate a management oriented research project directed at identifying a scientifically accepted control technique(s) for the Australasian isopod <i>Sphaeroma quoyanum</i> that has invaded Sweetwater Marsh.
		✓	If and when a scientifically accepted control technique is identified for <i>Sphaeroma quoyanum</i> , implement this technique to control or eradicate this invasive species from the Refuge's intertidal habitats.

***Objective 1.3: Restore Native Upland and Upland Transition Habitat***

*To restore the historic community structure of the wetland-upland transition within the Refuge, increase native species richness by at least 30 percent, increase native plant cover to 40 percent, and reduce perennial invasive plants to less than five percent cover along the marsh fringe over the next 15 years. Restore 25 acres of appropriate native upland scrub habitat on Gunpowder Point to achieve 50 percent cover of native perennial species such as flat-top buckwheat (*Eriogonum fasciculatum*), California sagebrush (*Artemisia californica*), lemonade berry (*Rhus integrifolia*), and California encelia (*Encelia californica*).*

**Rationale:** The native upland transition habitat (refer to Section 3.4.2.2) that once existed between the upper edge of the Bay's tidal marshes and the adjacent upland vegetation has been almost completely eliminated as a result of urban development and human disturbance (U.S. Navy 2000). This habitat plays an important role in the life history of many avian species which depend on upland transition areas for shelter during high tide and adverse weather conditions. The native plants found in this habitat also attract native pollinators important in the pollination of salt marsh bird's beak. A few remnants of this habitat can be found around the perimeter of Gunpowder Point and Paradise Marsh, but in general, very little good quality native wetland-upland transition habitat remains. Fortunately, there are opportunities to restore native wetland-upland transition habitat on this Refuge Unit.

Objective 1.3 - Restore Native Upland and Upland Transition Habitat <i>Comparison by Alternative</i>			
Alternative			Strategy
A	B	C	
✓	✓	✓	Continue invasive plant species control along the periphery of the marsh to control invasive, non-native plants.
✓	✓		Review and approve, as appropriate, restoration plans proposed for up to 30 acres of upland habitat within the Gunpowder Point mitigation leasehold overlay prior to March 2010.
		✓	Determine an appropriate species composition for restoring upland (consisting of an appropriate mix of maritime succulent scrub and coastal sage scrub habitat) and wetland-upland transition habitat on Gunpowder Point. Complete the restoration plan for this area by 2010 and implement the plan when funding is identified for this project.
		✓	When funding for restoration is identified, restore 25 acres of upland and wetland-upland transition habitat on Gunpowder Point.

***Objective 1.4: Reduce Human Disturbance***

*By 2008, develop and implement plans to reduce human disturbance in the Refuge's coastal salt marsh and upland transition areas by 90 percent over a period of one year, with the goal of reducing the need for contacts with offending individuals to no more than two per month.*

**Rationale:** Human activity within sensitive habitats can cause significant disturbance to fish and wildlife, while foot and vehicle traffic can damage seedlings of sensitive plants. Human presence on the water or along the shore can disturb roosting and foraging birds, resulting in the expenditure of energy needed for migration. Various studies on the effects of wildlife disturbance have shown that general bird use decreases as frequency of disturbance increases (DeLong and Schmidt 2002). Human disturbance compounds the effects of habitat loss for many birds and other fish and wildlife that depend upon coastal wetlands for survival. Control

of human disturbance is a recommended action of the light-footed clapper rail and California least tern recovery plans and the Southern Pacific Coast Regional Shorebird Plan.

Objective 1.4 - Reduce Human Disturbance <i>Comparison by Alternative</i>			
<i>Alternative</i>			<i>Strategy</i>
A	B	C	
	✓	✓	Implement a public outreach program to reduce unauthorized access on the Refuge and increase public awareness of disturbance impacts by conducting public meetings, providing information to the media; installing appropriate interpretive signs, and contacting offenders.
	✓	✓	Coordinate with local agencies and landowners to develop effective measures for deterring residents and pets from entering the Refuge.
	✓	✓	Encourage local agencies to develop and implement appropriate grading, fencing, drainage, lighting, pedestrian/vehicular circulation, and other design standards for development proposed near the Refuge.

***Objective 1.5: Watershed Management Planning***

*Coordinate with State and local agencies working on management plans for watersheds affecting this Refuge Unit to assist in developing measures that would protect and restore functions and values of the Refuge's coastal wetlands when implemented.*

**Rationale:** Within San Diego's coastal watersheds, nine species are currently listed as endangered, two are listed as threatened, and at least fourteen are included on the Service's list of Birds of Conservation Concern. Some of these species, including the light-footed clapper rail, could be adversely affected over time by storm water pollution and urban runoff.

The storm water and urban runoff that flows through the Refuge and into San Diego Bay originates from throughout the watershed, traveling across a variety of jurisdictional boundaries. Water quality is influenced by numerous land use practices and these practices may be regulated differently in each jurisdiction. To account for these differences, efforts to implement effective measures for improving and protecting water quality throughout the watershed must be addressed at the regional level. The Comprehensive Management Plan for San Diego Bay (*San Diego Bay Interagency Water Quality Panel 1998*) suggests that through a watershed approach to land and resource management, consistent measures for addressing water quality can be developed and implemented, and recommendations for restoring and maintaining the physical, chemical, and biological quality of coastal waters and associated habitats can be developed. To ensure that this regional effort addresses the effects of water quality on the Refuge, the Service should take an active role in regional watershed planning.

Objective 1.5 - Watershed Management Planning <i>Comparison by Alternative</i>			
<i>Alternative</i>			<i>Strategy</i>
A	B	C	
✓	✓	✓	Participate in the development of watershed management plans for those watersheds the influence habitat quality in the Refuge.
		✓	Assist in identifying appropriate methods for stabilizing erosion within the watershed and preventing downstream sedimentation that could adversely affect coastal salt marsh habitat.



**GOAL 2: Support the recovery and protection efforts for the federally and state listed threatened and endangered species and species of concern that occur within the Sweetwater Marsh Unit.**

***Objective 2.1: California Least Terns and Western Snowy Plovers***

*Through a combination of nest site enhancement, monitoring and associated management actions, and improved access to restored foraging areas, maintain a 15-year average of at least one fledged chick per least tern nest with at least 100 least tern nests established annually within five years of implementing the proposed enhancements, and for snowy plovers maintain a 15-year average of one fledged chick per male snowy plover with at least 20 snowy plover nests established annually within five years of implementing the proposed enhancements.*

**Rationale:** Many of the historic nesting grounds once used by the California least tern and western snowy plover have been lost to intensive human encroachment along the coast, causing these species to seek nesting sites on mud and sand flats set back from the ocean. Six such nesting sites are intensively managed for these species in San Diego Bay, including the D Street Fill. Nesting success at D Street Fill has varied over the years, with least tern use increasing but productivity in need of improvement. Snowy plovers have not nested here since 2000. Factors influencing nesting success or failure include the number of predators present, the amount of nesting activity occurring in a given area, the presence or absence of appropriate nesting substrate, and access to appropriate foraging areas. On this site, providing support for successful tern and plover nesting requires predator and vegetation management, substrate enhancements (capping the nesting area with light sand and adding shell fragments to provide additional cover from predators), control of human disturbance, and improved access to intertidal areas for plover chicks. Such measures are consistent with the approved recovery actions for these species.

Objective 2.1 - California Least Terns and Western Snowy Plovers			
Comparison by Alternative			
Alternative			Strategy
A	B	C	
✓	✓	✓	Continue to partner with the Port in the annual site preparation of at least 30 acres of nesting habitat at D Street Fill.
✓	✓	✓	Continue to conduct predator management to reduce predation of snowy plovers and least terns during the nesting season.
✓	✓	✓	Continue to monitor nesting season activity, fledgling productivity, and type and extent of predation at D Street Fill, per available funding.
	✓	✓	Enhance the nesting substrate on about 15 acres of the D Street Fill by placing six to eight inches of light sand over the existing surface and spreading shell fragments on top of this sand cap.
		✓	Increase the area designated for nesting habitat on the D Street Fill by 10 acres and maintain this area to provide a total of 33 acres of nesting habitat on this Refuge Unit for at least the next 15 years.
		✓	Recontour the slopes along the southern edge of the D Street Fill to restore and maintain snowy plover access to adjacent foraging areas and design adjacent restored intertidal habitat to provide new foraging opportunities for plovers and terns in proximity to nesting areas.
	✓	✓	Reduce human and mammalian disturbance in the nesting area by improving fencing and signage where appropriate.

**Objective 2.2: Improve Marsh Management to Benefit Listed Species**

*Within five years of the CCP's approval, develop a Habitat Management Plan that includes measures to improve habitat quality for the light-footed clapper rail and salt marsh bird's beak within the 190 acres of intertidal wetland habitat on the Refuge.*

**Rationale:** A variety of recovery plans, migratory bird plans, and local multiple species conservation plans have been approved that address one or more of the marsh dependent species found on the Sweetwater Marsh Unit. Through the preparation of the HMP, the relevant recommendations and proposed actions included in these plans could be consolidated into specific management actions for this Refuge Unit. Specific recommendations for marsh management are included in the Salt Marsh Bird's Beak Recovery Plan (*USFWS 1985b*), while other species-specific recommendations are included in the recovery plans for the light-footed clapper rail and California least tern.

Objective 2.2 - Restore Intertidal Wetlands <i>Comparison by Alternative</i>			
<i>Alternative</i>			<i>Strategy</i>
A	B	C	
	✓	✓	Complete a native plant and wildlife species inventory and map the distribution of all special status species in the marsh by 2010.
	✓	✓	Develop and implement measures for protecting and managing at least 20 acres of high marsh habitat to support salt marsh bird's beak.

**GOAL 3: Protect and restore the environmental health of the Refuge's coastal salt marsh and upland habitats by making contaminants remediation a priority for Refuge lands, adjacent properties, and upstream developments.**

**Objective 3.1: Contaminants Management**

*Within three years of identifying a funding source, work with the Service's Division of Environmental Contaminants to develop and implement a baseline sampling plan for determining the extent and nature the Refuge's known or suspected containment areas, as identified in the CAP, and develop and implement a water quality monitoring program to characterize the quality of water entering the Refuge from upstream sources.*

**Rationale:** Environmental contaminants can result in fish kills, bird die-offs, developmental or reproductive abnormalities in many vertebrate species, and other instances of harm to fish and wildlife populations. Over the years, pesticides and other environmental contaminants have been contributing factors in the decline of populations of many bird species. Scientific analysis of the combined or synergistic impacts of specific combinations and concentrations of contaminants in the environment is limited. The U.S. Environmental Protection Agency does however provide some guidance regarding the level of remediation required to declare a site "clean" and free of unacceptable levels of toxic compounds.

The Service, which is one of several agencies that act as "trustees" for the nation's natural resources, has responsibility for NWRs, endangered and threatened species, migratory birds, and other natural resources. To address contaminants issues, the Service employs environmental contaminant specialists responsible for conducting field studies to determine sources of pollution, investigate pollution effects on fish and wildlife and their habitat, and investigate fish and wildlife die-offs. Sites typically assessed include those impacted by pesticides, industrial wastes, oil and hazardous waste spills, and other sources.

Preliminary analyses of several sites on the Sweetwater Marsh Unit indicate the presence of contaminants. These contaminants are associated with past and present industrial and agricultural activities occurring on or adjacent to current Refuge lands. The initiation of baseline sampling is required to fully assess the potential threat to Refuge resources posed by these contaminants. Depending upon the results of baseline sampling, more detailed contaminants investigations and/or clean up or remediation efforts could be warranted.

Objective 3.1 - Contaminants Management <i>Comparison by Alternative</i>			
<i>Alternative</i>			<i>Strategy</i>
A	B	C	
✓	✓	✓	Continue to work with the appropriate agencies/landowners to identify and remediate contaminant issues on Refuge and adjacent lands.
	✓	✓	Seek funding for, develop, and implement a baseline sampling plan based on the recommends included in the CAP.
	✓	✓	Identify funding to remove/remediate the polyethylene sheeting buried on Gunpowder Point.
	✓	✓	Seek funding to implement wet and dry weather water quality monitoring within the Refuge Unit. Monitoring should target surface waters entering from Paradise Creek, Bannister Creek, the Sweetwater River, and I-5 and SR-54 drainage channels.

***Objective 3.2: Spill Contingency Plan***

*By FY 2008, develop a site-specific contingency plan for the Refuge that provides Refuge staff with guidance on the safe and effective response to a hazardous substance spill within or upstream of the Refuge and includes a public outreach component to inform the public, appropriate agencies, and upstream landowners and businesses of the notification procedures that should be taken if a spill occurs upstream of the Refuge.*

**Rationale:** The Refuge is located at the bottom of the watershed that supports a variety of commercial and industrial uses. Several potential transport pathways have been identified in the CAP that could provide a pathway for hazardous materials from an accidental spill to enter the Refuge's sensitive coastal wetlands. To ensure that safe and effective responses are implemented in a manner that best protect fish and wildlife resources and their habitats in the event of a spill, it is essential that a spill contingency plan be developed for the Refuge. Spills are more easily contained in early stages and near the source. A contingency plan would facilitate prompt notification of appropriate staff and provide for the effective execution of containment and cleanup measures.

Objective 3.2 – Spill Contingency Plan <i>Comparison by Alternative</i>			
<i>Alternative</i>			<i>Strategy</i>
A	B	C	
✓	✓	✓	By FY 2008, complete a spill contingency plan for the Refuge and begin public outreach to ensure prompt notification in the event of a spill.
✓	✓	✓	Once funding is identified, characterize the baseline contaminants conditions on the Refuge to document pre-spill conditions.

**GOAL 4: Provide outstanding environmental education programs for all ages in partnership with the Chula Vista Nature Center and other public agencies and non-governmental organizations.**

***Objective 4.1: Environmental Education***

*Within six years of CCP approval, increase student/teacher participation in existing environmental education programs on the Refuge, particularly Sweetwater Safari, to 600 students per year.*

**Rationale:** The Sweetwater Safari environmental education program has generated considerable interest from the school districts in the immediate vicinity of the Refuge. The interest in this program is bolstered by the availability of private sector funding to cover the costs of transportation from the school to the Refuge. The program is viewed as a valuable tool in the region for educating students about coastal wetlands, ecological processes, and the natural environment. Many of the lessons included in this program are applicable to the variety of coastal wetlands currently being restored and protected in San Diego County and at present there is no other program like it in the country. It would be a logical next step in implementing the Refuge's environmental education program to expand the availability of this program to teachers and students throughout the region.

Objective 4.1 - Environmental Education			
<i>Comparison by Alternative</i>			
<i>Alternative</i>			<i>Strategy</i>
<i>A</i>	<i>B</i>	<i>C</i>	
✓	✓	✓	Continue to work with partners to support the variety of environmental education programs currently occurring on the Refuge.
		✓	Renew existing private partnerships and identify new partners to participate in providing free transportation for districts with limited or no transportation funding for field trips.
		✓	Redesign the existing Gunpowder Point trail system and accompanying interpretive elements to complement existing and planned environmental education programs.
		✓	Work with partners such as the Chula Vista Nature Center, San Diego Zoological Society, County Department of Education, and various school districts to develop a South Bay environmental education facilitator position within an appropriate county agency or organization.

**GOAL 5: Provide quality wildlife-dependent recreation, interpretation, and outreach opportunities to enhance public appreciation, understanding, and enjoyment of the Refuge's biological and cultural resources.**

***Objective 5.1: Wildlife Observation and Photography***

*As funding is identified, develop and implement a redesigned interpretive trail plan for Gunpowder Point that improves opportunities for wildlife observation and is better coordinated with the interpretive and educational programs occurring at the Chula Vista Nature Center.*

**Rationale:** Many visitors to the Sweetwater Marsh Unit are drawn by the opportunities available to observe the Refuge's diverse array of migratory bird species. Others visit in hopes of catching a glimpse of the elusive light-footed clapper rails that live on the Refuge year round. Wildlife observation and photography are two of the six priority public uses of the NWRs. Observation opportunities promote a broader public understanding of the value of natural resources and the need to conserve these resources. Every effort should be made to facilitate quality wildlife observation and photography opportunities, without compromising wildlife and habitat values.

Objective 5.1 - Wildlife Observation and Photography <i>Comparison by Alternative</i>			
<i>Alternative</i>			<i>Strategy</i>
A	B	C	
✓	✓		Continue to provide opportunities for wildlife observation and photography on Gunpowder Point by maintaining the existing interpretive trail system and bird blind.
		✓	Enhance the current opportunities for wildlife observation by incorporating observation areas into the new design for the interpretive trail to be prepared for Gunpowder Point.

***Objective 5.2: Environmental Interpretation***

*Within three years of identifying funding, design and install an updated interpretive plan for the redesigned trail system on Gunpowder Point. Coordinate this planning with the interpretive and educational programs occurring at the Chula Vista Nature Center and include interpretive elements that will reach a broader audience.*

**Rationale:** The Sweetwater Marsh Unit, which is situated within a highly urbanized metropolitan area, provides an excellent opportunity for visitors to escape the urban environment and experience the natural coastal resources that once dominated San Diego Bay. The Refuge's proximity to this urban area also provides the opportunity to interpret the mission of the NWRs and the many resources found on the Refuge. Interpretation should be expanded to more thoroughly address the Refuge's full array of natural and cultural resources. Interpretive elements related to early Native American activities around the bay are extremely limited. Gunpowder Point provides the opportunity to incorporate this history into the proposed interpretive program. There is also a need within the Refuge Complex to identify innovative ways to reach new and non-traditional audiences through expanded partnerships, cross-border activities, special events, and off-site programs.

Objective 5.2 - Environmental Interpretation <i>Comparison by Alternative</i>			
<i>Alternative</i>			<i>Strategy</i>
A	B	C	
✓			Continue to maintain the existing interpretive materials provided along the current trail system on Gunpowder Point.
✓	✓	✓	Continue to support the "Birds and Bikes" interpretive program developed by the Paradise Creek Educational Park, Inc.
	✓	✓	Develop an interpretive program for the F&G Street Marsh in partnership with the City of Chula Vista <u>that describes the importance of protecting coastal wetlands and the wildlife it supports.</u>



Objective 5.2 - Environmental Interpretation (continued)			
Alternative			Strategy
A	B	C	
	✓	✓	Develop an interpretive program for Paradise Marsh in partnership with the City of National City that is directed toward a younger, non-traditional audience and include multi-lingual interpretation.
		✓	Within three years of the CCP's approval, develop an interpretive plan for the redesigned trail system on Gunpowder Point that addresses natural and cultural resources and includes designs for new interpretive elements intended to reach new and non-traditional audiences.
		✓	Within six years of the CCP's approval, fabricate and install the various interpretive elements along the Gunpowder Point trail system.

***Objective 5.3: Cultural Resource Program***

*Implement proactive management of cultural resources that focuses on meeting the requirements of the National Historic Preservation Act, including consultation, identification, inventory, evaluation, and protection of cultural resources, and also on interpreting the archaeological and historic history of the lands now occupied by the Refuge.*

**Rationale:** It is the policy of the Service to identify, protect, and manage cultural resources located on Service lands and affected by Service undertakings, in a spirit of stewardship, for future generations. Cultural resources connect us to our past, providing the means to study and reflect upon the events and processes that have shaped our nation, our communities and ourselves. Many are unique and irreplaceable. Their true value rests in what they offer us in terms of scientific information, interpretive opportunities, and cultural identity. Cultural resources can provide important information about changes to our environment and landscapes over thousands of years. This information contributes directly to the Service's primary mission of managing wildlife and natural landscapes.

Through the interpretation of cultural resources the Service has the opportunity to help educate millions of refuge visitors each year about how humans interact with their natural environment and changes to landscapes over time. The management and protection of cultural resources is an important component of the goals for the San Diego Bay NWR, because of the cultural resources protected within the Refuge boundaries.

Objective 5.3 - Cultural Resource Program <i>Comparison by Alternative</i>			
Alternative			Strategy
A	B	C	
✓	✓	✓	Comply with all applicable cultural resource regulations and policies prior to implementing a project that would disturb any surface or subsurface cultural resources.
✓	✓	✓	Create and utilize a Memorandum of Understanding with Native American groups to implement the inadvertent discovery clause of the Native American Graves Protection and Repatriation Act (NAGPRA).
	✓	✓	Seek funding to survey, record, evaluate, and interpret the Hercules Powder Company plant site on Gunpowder Point according to the regulations of the NHPA.

Objective 5.3 - Cultural Resource Program (continued)			
Alternative			Strategy
A	B	C	
	✓	✓	Develop interpretive elements to describe the cultural history of the area by working with federally recognized Tribes and other interested parties, including historical societies and museums, and install these elements along the realigned trail.

## 2.3 Alternatives for the South San Diego Bay Unit

### 2.3.1 Similarities Among Alternatives

Although there are distinct differences among the range of alternatives presented for the South San Diego Bay Unit, the alternatives also include several features and management components that would be part of the CCP regardless of the alternative selected for implementation.

#### 2.3.1.1 Features Common to All Alternatives

Features common to all alternatives are summarized below. To reduce repetition in the alternative descriptions, those features that are common among all of the alternatives are described in detail only under Alternative A – No Action.

- *Monitoring of Listed Species* – Annual endangered species monitoring of nesting activity at the salt works would continue, per available funding. The focus of this monitoring effort is on the activities and nesting success of the federally listed endangered California least tern and threatened western snowy plover. Monitors also record nesting activity and productivity for the various species of colonial seabirds that annually nest on the levees. Periodic surveys would also be conducted within the Otay River floodplain to monitor the activities of the endangered light-footed clapper rail.
- *Multiple Species Conservation Program (MSCP) Monitoring* – Annual surveys to identify the presence of salt marsh bird's beak and/or Nuttall's lotus are conducted on the Refuge in accordance with the City of San Diego's MSCP.
- *Habitat Enhancement Related to the Cooperative Agreement between the Service and the Port* – Each alternative includes the implementation of the enhancement activities described in the Cooperative Agreement between the Port and the Service (refer to Section 1.6.3). These activities involve substrate enhancement (e.g. adding clean sand) on known and/or potential least tern nesting areas within the salt works and expanding current foraging opportunities for least terns within one or more of the salt ponds.
- *Invasive Plant Species Control* – Periodic control of invasive plant species, such as castor bean, tamarisk, giant reed, garland chrysanthemum, tree tobacco, and fennel, would be conducted within the Otay River floodplain.
- *Lease Additional Areas with the Acquisition Boundary* – The Service would continue to work with the Port, City of Chula Vista, and State Lands Commission to lease the remaining areas of the bay within the approved acquisition boundary for the protection and management of fish and wildlife.

- *Adjacent Land Use Coordination Activities* – The Service would continue to work with the surrounding jurisdictions (e.g. the cities of San Diego, Chula Vista, Imperial Beach, and Coronado, the Port, Airport Authority, U.S. Navy, and Caltrans) to ensure that adverse effects to Refuge resources from offsite activities are avoided or mitigated.
- *Environmental Contaminants Coordination* – With assistance from the Service’s Division of Environmental Contaminants, Refuge staff would seek funding to implement a contaminants site characterization for the Otay River floodplain and the salt ponds to determine if further investigations, and/or remediation are necessary.
- *Protection of Cultural Resources* – Cultural resources included within the Refuge would be managed in accordance with public law and agency policy. The Refuge Manager would continue to consider the effects of all proposed actions on the Refuge’s archaeological and historic properties and would consult with the SHPO, federally recognized Tribes, and interested parties prior to implementing any ground-disturbing projects.
- *Public Access Restrictions* – Public access onto the salt pond levees would continue to be restricted to guided nature tours or organized interpretive programs.
- *Opportunities for Fishing and Boating* – Fishing and boating within the open waters of the bay would continue to be permitted within the Refuge boundary in accordance with State fishing regulations and the 5 mile per hour (mph) “no wake” speed limit for all watercraft operating outside the main channel to the Chula Vista Harbor.
- *Wildlife Observation and Photography* – Opportunities for wildlife observation and photography would continue to be provided within the Refuge Unit.
- *Environmental Education* – The Habitat Heroes program would continue to provide environmental education opportunities for students in the vicinity of the Refuge.
- *Facilitation of Scientific Research* – Under any alternative, scientific research activities would be encouraged, provided the activities are consistent with Refuge purposes and the mission of the NWRS.
- *Fire Management* – The primary fire management proposals for the South San Diego Bay Unit, as described in the San Diego NWR Complex Fire Management Plan (refer to Appendix L), are suppression, prevention, and hazard fuel abatement in the Wildland Urban Interface. These proposals would remain the same under any alternative.
- *Predator Management* – The predator management plan described for the Sweetwater Marsh Unit would also be implemented on the South San Diego Bay Unit to reduce the adverse effects of predators on California least terns, western snowy plovers, and light-footed clapper rails. This predator management plan is presented in detail in Appendix M.

### **2.3.1.2 Features Common to All Action Alternatives**

The following feature is common to all of the action alternatives, but would not be implemented as part of the no action alternative.

- *Enhancement and Expansion of Nesting Opportunities* – A number of proposals would be implemented to improve nesting opportunities for the California least tern, western snowy plover, and other colonial nesting seabirds. These include enhancing nesting substrate on the levees, widening some levees, and managing the water levels in one or two ponds to provide new nesting opportunities for the western snowy plover.
- *Development of a Monofilament Recovery and Recycling Program* – A program modeled after the Monofilament Recovery & Recycling Program (MRRP) developed by the Florida Fish and Wildlife Conservation Commission would be implemented within the Refuge under all of the action alternatives.

## 2.3.2 Detailed Description of the Alternatives

### 2.3.2.1 Alternative A - No Action

The no action alternative (Figure 2-5) assumes no change to past and present management activities on the South San Diego Bay Unit. Under this alternative the management practices identified as necessary when the Refuge was established in 1999 would continue to be implemented and the public uses currently permitted would be maintained. In addition, commercial solar salt production would continue to operate on the Refuge under a Refuge Special Use Permit.

This alternative represents the baseline from which the other action alternatives for the South San Diego Bay Unit are to be evaluated. At present, the Refuge operates without a comprehensive management plan and no step-down plans have been prepared. Therefore, under this alternative, current management activities would be incorporated into the CCP to formally establish ongoing management direction for the Refuge for the next 15 years.

Despite the lack of a formal management plan, management direction for this Refuge is provided in the California Brown Pelican Recovery Plan (*USFWS 1983*), California Least Tern Recovery Plan (*USFWS 1985a*), the Light-footed Clapper Rail Recovery Plan (*USFWS 1985c*), and a number of national and regional bird conservation plans including the Southern Pacific Shorebird Conservation Plan (*Hickey et al. 2003*), the Riparian Bird Conservation Plan (*Riparian Habitat Joint Venture 2000*), and the draft North American Waterbird Conservation Plan Volume 1: Seabirds and Colonial Waterbirds (*North American Waterbird Conservation Plan Steering Committee 2001*).

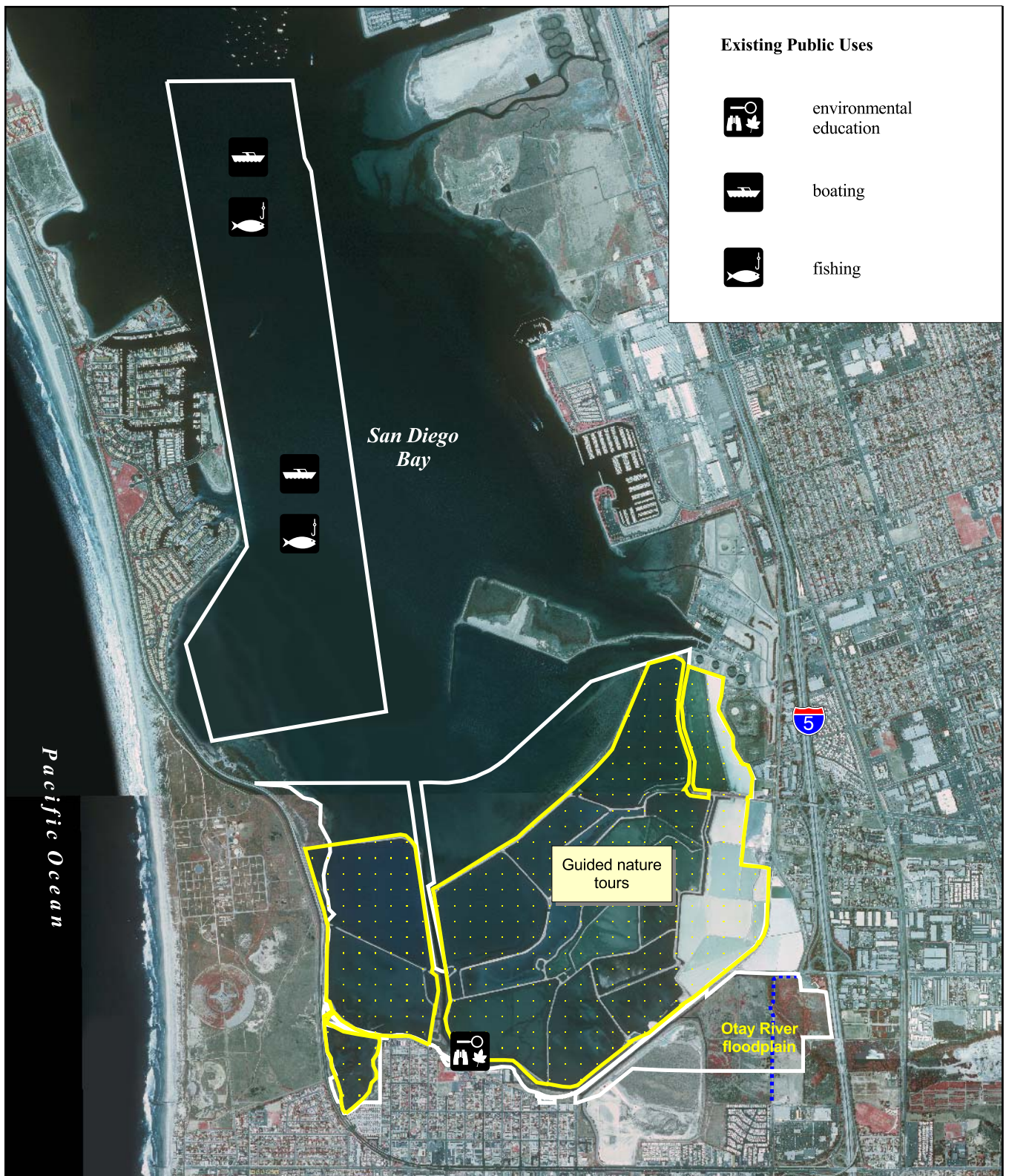
Presented below is a detailed discussion of the management activities and public uses currently occurring within the South San Diego Bay Unit.

### Wildlife and Habitat Management

#### **Endangered and Threatened Species and Other Species of Concern**

Under this alternative, wildlife and habitat management activities would continue to focus on the protection and recovery of those federally listed endangered and threatened species that are supported on this Refuge Unit. These management practices also provide benefits to state listed species, Birds of Conservation Concern, and species covered by San Diego's Multiple Species Conservation Program Subarea Plan (1997).

California Least Terns and Western Snowy Plovers: The federally listed endangered California least tern and threatened western snowy plover both nest on the salt pond levees within the South San Diego Bay Unit. To improve nesting conditions on the levees, Refuge staff has been enhancing historic nesting areas by depositing a layer of sand over existing levee tops. This multiple year project began in 2002. The placement of six to



**Figure 2-5 South San Diego Bay Unit, Alternative A**



South San Diego Bay Unit  
Existing Management Authority



Solar salt production



Bike path



0 0.25 0.5 Miles

Source: USFWS, Local Agency Partnership 2000 (2 ft imagery)

Carlsbad Field Office - 2003  
/stem/stacey/ssdbay/fig\_4-03/figures.apr



twelve inches of sand over the tops of these levees reduces the potential loss of chicks and eggs associated with the existing substrate conditions on the levees (refer to the Habitat Enhancement discussion below). Management of these species also includes annual monitoring of nesting success, implementing predator management (described in greater detail below), and enforcing access restrictions into the salt works throughout the year.

Weekly monitoring of nesting activity is conducted annually from March through September, utilizing Refuge staff, qualified contractors, and volunteers which are supervised by Refuge staff. Monitoring duties include recording nest locations, dates of nest initiation, pair number estimates; tallying of total nesting attempts; hatching success; chick banding; estimates of fledgling productivity; and incidental observations. At the end of each season, an annual report is issued that summarizes the year's monitoring results, evaluates current nesting conditions, and when appropriate suggests changes in current management practices to improve fledgling success for these species.

California Brown Pelican: The levee between Ponds 10 and 11 is a popular roosting area for California brown pelican. Current management actions to protect this roosting area include fencing and signage to discourage trespass onto the levees and active monitoring to ensure that unauthorized access onto this area does not occur.

Pelican roosting opportunities were recently expanded on the Refuge as a result of funding provided through the American Trader Final Restoration Plan. The specific project involved installing a floating platform in the salt ponds to provide isolated night roosting areas for the pelicans. The platform, which is anchored in place, is designed to range in size from 400 to 1,600 square feet depending upon the needs of the area. The facility is portable and can be relocated to another pond if necessary. Pelican activities on the platform will be monitored monthly for a period of one year to determine actual use by pelicans as a night roosting area. If monitoring results demonstrate positive benefits to the pelican, up to two additional platforms could be installed within the salt ponds.

Light-footed Clapper Rail: To better understand the current status of the light-footed clapper rail population within the South San Diego Bay Unit, an annual call-count survey is conducted between February and March of each year along the Otay River channel, one of the last remaining areas on the Refuge that supports habitat suitable for clapper rails. Predator management is also implemented year-round to avoid or minimize the loss of rails to mammalian predators.

Nesting Seabirds: The salt pond levees also provided nesting habitat for an array of colonial nesting seabirds, including the gull-billed tern, elegant tern, and black skimmer, all of which are listed by the Service as Birds of Conservation Concern (*USFWS 2002b*). These species benefit from the management actions being taken to protect the least tern and snowy plover and nesting productivity is noted for all seabird nesting activity during annual monitoring of the nesting colonies on the levees.

Beginning in March 2002, monitoring of nesting activity within the tern colonies was expanded to increase data collection related to the gull-billed tern. These additional monitoring responsibilities include recording gull-billed tern nesting productivity and foraging activity within the Refuge. Specifically, the location of nests, as well as the number and condition of gull-billed tern eggs, chicks, and adults, are recorded. Foraging preferences, including possible predation of listed species, are also monitored and recorded. The results obtained from these monitoring activities will assist the Service in

identifying additional research needs required to develop and refine an appropriate adaptive management program for the various seabirds that nest within this Refuge Unit.

### **Habitat Management**

Control of Invasive Plants: The primary habitat management activities conducted on the Refuge involve the control of weedy and non-native, invasive plants in the Otay River floodplain. Annually in the late winter or early spring, the abandoned agricultural fields within the Refuge are mowed or disked to reduce the total biomass of weedy vegetation, as well as to reduce weed seed production. In addition, manual, mechanical, and chemical control of non-native, invasive plants, such as giant reed, tamarisk, and castor bean, are periodically implemented to encourage the natural recruitment of native riparian species. The method chosen to control these species is based on the size of the infestation and the species of plant being controlled. A glyphosate based product containing no surfactant is used, when chemical control is determined to be the most appropriate means for controlling invasive plants. Chemical control is conducted only by individuals possessing a Qualified Applicator's License. Other activities include litter control and maintenance of gates and regulatory signage.

Salt Pond Management: Under existing conditions, the salt works is operated by a private commercial entity in accordance with the conditions of a Refuge Special Use Permit. Managing pond salinities, regulating the water levels in the ponds, and maintaining the levees are all the responsibility of the salt works operator. The conditions in the Special Use Permit restrict access to certain levees during the nesting season and establish seasonal controls on maximum water levels in some ponds that support migratory bird nesting. This alternative assumes that solar salt production would continue for at least another 15 years.

Although this alternative assumes the continuation of solar salt production, it should be recognized that the viability of this operation could be influenced by factors outside the control of the Service. For instance, the current operator may determine that salt production is no longer economically viable and decide to cease operations at the facility. There is also the possibility that the Airport Authority, which owns Pond 40, a portion of Pond 42, and the salt processing plant, may chose not to extend the current lease for solar salt production and/or sell its property when the current lease expires in 2007. If solar salt production were to be discontinued for any reason, the Service would have two options for managing the ponds in the absence of salt production: 1) continue to move water through the system until restoration planning is complete, or 2) immediately obtain the necessary approvals to breach the ponds and reestablish tidal action without altering the existing elevations within the ponds (refer to Alternative D, Scenario 3).

The implementation of either option would avoid excessive salinity increases within the closed system following the closure of the salt processing operation. Based on the experiences of the California Department of Fish and Game at the Napa River Salt Ponds in northern San Francisco Bay, inadequate water management can result in increased costs of moving the water through the system, lowered sediment and water column pH in parts of the system, and increased impoundment of sodium chloride and bittern salts within the ponds (*Siegel and Bachand 2002*). This situation would make future restoration much more difficult and expensive to implement.

### **Habitat Enhancement**

Two enhancement projects are to be implemented in accordance with the Cooperative Agreement between the Service and Port (refer to Sections 1.6.3 and 1.7.3). These projects involve improving the nesting substrate for the California least tern on the salt pond levees and expanding foraging opportunities, primarily for the least tern, within one or more of the salt ponds.

Enhancement of nesting substrate on the levees began in 2002 and would continue under this alternative. Per the Cooperative Agreement, the Port has provided \$150,000 to enhance a minimum of three acres of nesting habitat for the least tern. The Refuge Complex has also obtained additional funding and a donation of sand to expand substrate enhancement to improve nesting habitat for the range of seabirds that annually nest on the salt pond levees. This enhancement is necessary to improve seabird fledgling success. Monitoring has revealed that the existing substrate on many of the levee tops can cause a threat to small chicks when the surface becomes wet. Occasional light rain causes the silty substrate to become sticky and adhere to chicks' feathers and beaks, often resulting in death. This same condition can cause eggs to adhere to the surface causing the death of the developing embryo. This problem can be avoided by capping the levee tops with a layer of larger grained sand (ideally at a depth of six to twelve inches or more). Monitoring conducted following the first year of this enhancement project suggests that the enhanced levees are appealing to several species of seabirds that regularly nest on the levees.

The Cooperative Agreement also required the Port to provide \$50,000 to the Service to increase foraging habitat within the Refuge for least terns. Under this alternative, the \$50,000 would most likely be used to restore all or a portion of Pond 28 or 29 to shallow subtidal habitat. To achieve the desired habitat, the selected pond would be breached in order to restore regular daily tidal exchange within the pond. Assuming Pond 28 or 29 is selected; the pond would first be drained by moving the water from the pond into another portion of the salt works. Restoration would proceed by breaking up and/or removing the gypsum and salt crust from the bottom of the pond, creating a connection between the pond and the bay, and finally breaching the levee to allow bay water to flow into and out of the pond through daily tidal action.

### **Lease Additional Areas within the Refuge's Management Authority**

To ensure the preservation of those coastal habitats that support the listed species being conserved within this Refuge Unit, the Service would continue to work with the Port, City of Chula Vista, and State Lands Commission to secure management authority over much of the remaining open water areas included within the Refuge's approved acquisition boundary. Currently, the Service has management authority over approximately 955 acres of open water within the acquisition boundary (refer to Figure 1-5). Another 1,075 acres of open water within the acquisition boundary is managed by the Port, while the U.S. Navy owns and manages the remaining 35 acres of open water and associated intertidal habitat within the acquisition boundary. Extending the Service's management authority to those areas currently managed by the Port would ensure uniform enforcement of existing regulations. This action would also provide the Service with the opportunity to manage this area to benefit of the migratory and wintering birds that utilize the shallow bay waters within the acquisition area.

## **Public Use Program**

### **Public Access**

With the exception of periodic guided tours of the salt works, public access within the South San Diego Bay Unit is currently restricted to the open waters of the bay. No public access is permitted within the Otay River floodplain or within the salt ponds themselves. These access restrictions would be maintained under this alternative.

### **Wildlife-Dependent Recreational Uses**

Under the no action alternative, the wildlife-dependent recreational uses currently provided on the South San Diego Bay Unit would continue. These uses include fishing, wildlife observation, photography, and environmental education. No opportunities for environmental interpretation or hunting are currently provided, nor are they proposed under this alternative. Additional information regarding the Refuge's existing wildlife-dependent recreational uses is presented below.

**Fishing:** Fishing is an allowable use throughout much of San Diego Bay, including the open portions of the bay that occur within the management boundary of the South San Diego Bay Unit. San Diego Bay supports approximately 35,000 to 40,000 recreational angler days per year, with much of the fishing activity occurring from boats (*U.S. Navy 2000*). Due to the shallow water depths in the South Bay, which range from less than a foot near the intertidal mudflats at low tide to about eight feet in the shallow subtidal areas, the majority of the recreational fishing in San Diego Bay takes place outside the Refuge boundary in the northern half of the bay. Some recreational fishing is conducted within the Refuge boundary using motorized and non-motorized shallow draft vessels, such as rowboats, powerboats, canoes, and kayaks. With the exception of the main channel into the Chula Vista Marina, all boating activity in the South Bay is subject to the posted 5 mile per hour speed limit, which is enforced by the Harbor Patrol in accordance with the San Diego Unified Port District Code.

Fishing activities within the Refuge would continue under this alternative in accordance with the rules and regulations established by the California Department of Fish and Game (State). In addition, fishing would continue to be prohibited within the Refuge's salt ponds.

With the exception of the salt pond levees, the Refuge does not include any upland areas in the vicinity of the bay. Therefore, under this alternative all fishing within the Refuge would continue to occur via a boat or an appropriate floating device. No boat ramps are provided on the Refuge and none are proposed. There are several public and private boat ramps in the immediate vicinity of the Refuge, including public boat ramps in Chula Vista at Bayfront Park, near the Chula Vista Marina, and in National City at Pepper Park (refer to Section 3.6.4.2 and Figure 3-21 for more information).

Commercial fishing is also permitted in the bay in accordance with State regulations. The California Fish and Game Code (Code) requires commercial operations to obtain a commercial fishing license and permit or other entitlement to conduct commercial fishing operations in California. Although permitted by the Code, no commercial fishing operations are currently occurring in the South Bay. Scientific collecting of fish and other organisms could also occur provided the collector has a valid scientific collecting permit from the State. This alternative includes no recommendations to change the current recreational or commercial fishing regulations or scientific collecting operations established for the Bay.

**Wildlife Observation and Photography:** While the open bay portions of the South San Diego Bay Unit are currently available for public access, the adjacent intertidal wetlands and upland areas are closed. As a result, the current opportunities for wildlife observation and photography are provided either in the bay via watercraft or immediately adjacent to the Refuge along the Bayshore Bikeway or from the Biological Study Area. Opportunities for wildlife observation are also occasionally provided within the salt works via guided nature tours. These tours, which are conducted outside of the nesting season, provide the public with opportunities to observe the range of migratory birds that forage along the mudflats to the north of the salt ponds.

**Environmental Education:** An environmental education program entitled “Habitat Heroes” was implemented on the Refuge in 2003. This program began with funding provided through a challenge cost share grant. Funding for subsequent years has been provided from various public and private sources. Funding for 2005 is currently being sought. To establish this program as a permanent use would require a dedicated stream of funding that has not yet been identified. This program has been designed to develop an appreciation for the importance of coastal wetlands by incorporating the use of GIS technology, traditional and internet-based instruction, cross-age student mentoring and habitat-based investigations into the program. The program’s primary focus is to address the issues of invasive plants and storm water pollution. The outdoor activities associated with this program occur on an area of the South San Diego Bay Unit that is located immediately adjacent to the Bayside Elementary School (refer to Figure 2-5). It is here that students map native and nonnative plants, remove invasive plant species, and cultivate and plant native vegetation. Program implementation involves partnering with elementary, secondary, and post secondary students and teachers, volunteer groups, trained environmental educators, the City of Imperial Beach, and interested individuals from the surrounding community. In 2004, 220 students from Emory Elementary School participated in this program.

### **Other Public Uses**

**Recreational Boating:** Boating is an allowable use throughout much of San Diego Bay, including the open bay portions of the Refuge. Boating activities occurred prior to the establishment of the Refuge and have continued in accordance with U.S. Coast Guard and Port regulations. Motorized and non-motorized vessels are used in the open bay portions of the Refuge, as well as within the Otay River channel when permitted by the tides. Although boating is not one of the six priority public uses of the NWRS, boating can facilitate other wildlife-dependent uses such as fishing, wildlife observation, and wildlife photography.

Due to the shallow water depths within most of the South San Diego Bay Unit (i.e., one to eight feet), boating is generally confined to shallow draft vessels of various categories, including rowboats, powerboats, canoes, kayaks, sail boards, paraboarding, and personal watercraft. The current speed limit within much of the south end of the bay, including Refuge waters, is 5 miles per hour and is enforced by the Port. Under this alternative, the current uses and speed restrictions would remain unchanged.

**Research:** Although there are opportunities for biological research on the South San Diego Bay Unit, only a few research projects have been undertaken to date. Before a research project can be conducted on the Refuge, the Service must review the proposal for consistency with Refuge purposes and the mission of the NWRS. When deemed consistent, the researcher is issued a Refuge Special Use Permit. The permit may include

conditions that are to be followed during research activities to avoid adverse impacts to Refuge resources. Once the research is completed, the researcher is required to provide Refuge staff with the results of the research, including subsequent publications. No changes to the way in which research is conducted on the Refuge would occur under this alternative.

### **Other Uses**

**Solar Salt Production:** Commercial solar salt production has occurred in the South Bay for over 130 years. Prior to the establishment of the Refuge, the ponds were operated by Western Salt Company, owned by the H.G. Fenton Company (Fenton). Today, most of the salt ponds are owned by the State Lands Commission and leased to the Service for management as a National Wildlife Refuge. The Service's lease with the State permits the continued use of the salt ponds for salt production, provided that the Service determines that this use is beneficial to the operation of the Refuge for wildlife habitat purposes.

As described in Section 1.7.3, the Cooperative Agreement between the Service and the Port that resulted in the establishment of the South San Diego Bay Unit, required the Port to purchase most of the private lands on which the salt works is located. In addition, the Port purchased the lease that Fenton had with the State Lands Commission for the remainder of the salt ponds within the bay. Because the purchase was made using public trust funds, once purchased, the properties reverted to public trust lands, which are held in trust for the residents of California by the State Lands Commission. A few parcels within the salt works were not included within the approved Refuge boundary: the "Fenton Ponds" (Ponds 50 – 54), which were retained by Fenton for future use or sale; Pond 20A, which is currently owned by the Port; and Pond 40 and the northern portion of Pond 42, which are owned by the San Diego County Regional Airport Authority (Airport Authority).

When the ponds were sold, Fenton sold their interest in solar salt production to South Bay Salt Works, which currently operates the salt works under a lease with the Airport Authority and a Refuge Special Use Permit. The current lease and Special Use Permit expire on December 31, 2007.

The Refuge Special Use Permit that allows the ponds to be used for solar salt production includes a number of special conditions intended to protect endangered species and other trust resources that occur on the Refuge. These conditions include: annually closing certain levees within the system during the migratory bird nesting season (March 15 to September 15); restricting any changes to the current configuration of the system without prior approval by the Service; limiting brine shrimp (*Artemia sp.*) harvesting to Pond 23; and permitting the Service to implement certain habitat enhancement projects outlined in the Cooperative Agreement, as described previously. Under the current agreement, the salt works operator is responsible for the maintenance of the ponds, levees, water circulation system, and all other aspects of the operation.

In accordance with the Cooperative Agreement, the Port was to receive revenues from the lease of the salt ponds through the year 2009. After that date, the Service would receive any revenues generated from the lease of the salt ponds for solar salt production. Since the signing of the Agreement, changes in State law occurred that have redefined the responsibilities of the Port. Specifically, the Port's previous responsibilities for airport management were redirected to the Airport Authority, which assumed control and operation of San Diego International Airport and its interests in January 2003. Some of those interests include the salt process plant, Pond 40, and a portion of Pond 42. As a



result of this change, the Airport Authority is now entitled to receive any revenue generated from the lease of the salt ponds for solar salt production through 2009.

Salt is produced on the Refuge through a process of solar evaporation. The current facility consists of a series of diked ponds (Figure 2-6) that are designed to facilitate the concentration and ultimate precipitation of salts from bay water. Once seawater is taken from the bay, it is moved between the ponds through pumping and gravity flow.

The salt ponds are divided into four categories: the primary system, secondary system, crystallizer system, and the heavy brine or bittern ponds (refer to Figure 2-6). To produce salt, bay water is introduced into the primary pond system, through tide gates located between the Otay River and Pond 10. As the water moves through this primary system, it is transported from Pond 11 to Pond 12 via a 30-inch siphon pipe that extends under the Otay River. When appropriate salinities are achieved in Pond 15, the last of the primary ponds, the brine is lifted by pump to the secondary system. At the end of the secondary system are the pickling ponds. These ponds are used to distribute the concentrated brine into the crystallizer ponds. At about 310 parts per thousand (ppt), the brine is saturated with sodium chloride and bittern salts (more soluble salts and ions consisting primarily of chloride, magnesium, sulfate, potassium, and bromide) and is ready to be introduced to the crystallizer system. Precipitation of sodium chloride occurs within the crystallizer ponds; once the salt has precipitated out, the ponds are drained and the salt is removed and transported to the processing plant for cleaning and drying. For a more detailed description of this process refer to Appendix F.

Approximately 60,000 to 80,000 tons of common salt (sodium chloride) are produced each year at this facility. The salt is sold for use in water softeners; for nitrate removal, ion exchange, pickling, and deicing; as a dyeing additive; as brine for petroleum products; and for use in the tuna industry as a means of controlling brine temperatures. Another salt produced as a byproduct of solar salt production is magnesium chloride, which is purchased by several industrial users in the area. As currently operated, the facility requires no discharge permits.

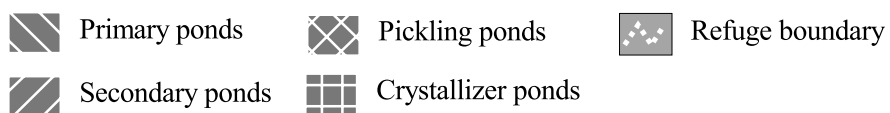
The no action alternative presumes that commercial solar salt production would continue on the Refuge for at least the next 15 years. However, changes to the current salt pond configuration are required due to the impending loss of Ponds 50 through 54 from the system. These ponds are privately owned and outside the approved acquisition boundary for the Refuge, therefore, the Service has no control over this area. The removal of these ponds from the system requires reconfiguration of other ponds to accommodate the functions that currently take place in Ponds 50 through 54. The permits required to make these changes to the system have already been obtained.

### **Environmental Contaminants Coordination**

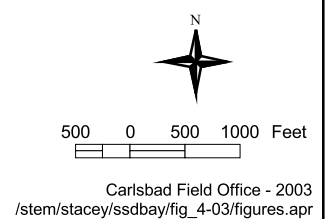
A CAP has been completed for the South San Diego Bay Unit that documents and assesses potential threats posed by environmental contaminants to the lands, waters, and biota of this Refuge Unit. In addition, contaminant transport pathways and sources of contaminants are identified and potentially contaminated areas delineated. Taking into consideration the goals, objectives, and strategies outlined in the CCP, the completed CAP prioritizes necessary sampling and cleanup actions, recommends future investigations, and describes appropriate methods for initiating pollution prevention activities on the Refuge and in the surrounding area. Under this alternative, as well as all of the action alternatives, the recommendations of the CAP would be implemented when funds are identified to complete specific actions.



**Figure 2-6 Salt Ponds of the South Bay Salt Works**



Source: USFWS, Local Agency Partnership 2000 (2 ft imagery)



### **Cultural Resource Management**

It is the policy of the NWRs to identify, protect, and manage cultural resources located on Service lands and affected by Service undertakings for the benefit of present and future generations. The South San Diego Bay Unit has been the subject of several cultural resource surveys; however, a complete survey of the Refuge has not yet been completed. The salt works is one historic resource that has been identified within the Refuge. This property was previously evaluated by the City of San Diego and has been deemed eligible to the NRHP.

A cultural resource survey would be conducted prior to implementing projects on the Refuge that involve ground disturbing activities. Any resources identified during the survey would be evaluated for eligibility to the NRHP and consultation would be completed with the SHPO, federally recognized Tribes, and interested parties. Any changes to the salt works would also require consultation with the SHPO. (For more information regarding cultural resources, refer to Section 3.5.)

### **Refuge Facilities**

With the exception of boundary markers and some access gates, no Refuge-related facilities such as offices or outbuildings are present within the South San Diego Bay Unit. Refuge management occurs out of the offices on the Sweetwater Marsh Unit, the Tijuana Slough NWR, and the San Diego NWR Complex in Carlsbad.

To ensure long-term access into the salt works, an agreement with one or more of the property owners to the east of the Refuge would be sought to establish a permanent easement for required management and maintenance activities, as well as to facilitate periodic guided nature tours from the public right-of-way into the salt works.

### **Step-Down Management Plans**

#### **Fire Management Plan**

Fire management on the South San Diego Bay Unit is addressed in the fire management plan prepared for the San Diego NWR Complex (Appendix L). In addressing this Refuge, the plan focuses on preparedness, wildland fire operations, prevention, and detection. Prescribed and Wildlife Fire Use is not proposed as a strategy for achieving land management objectives on this Refuge.

The primary elements of the fire management plan for the South San Diego Bay Unit include suppression, prevention and hazard fuel abatement in the Wildland Urban Interface. The primary fire prevention and hazard fuel abatement activity implemented on the South San Diego Unit is the annual mowing of the abandoned agricultural fields within the Otay River floodplain. In addition to hazard fire abatement, routine monitoring of the area by law enforcement staff is conducted to discourage illegal encampments, thereby reducing the potential for wildland fires on the Refuge.

#### **Predator Management Plan**

Under this alternative, predator management would continue to be implemented on the South San Diego Bay Unit pursuant to the Service's endangered species management responsibilities and in conjunction with other wildlife and habitat management activities. Predator management is necessary to conserve the least tern, western snowy plover, and light-footed clapper rail populations supported on this Refuge Unit. Predator

management would be implemented as described in Alternative A for the Sweetwater Marsh Unit (refer to Section 2.2.2.1). The draft predator management plan is provided for review in Appendix M.

### **2.3.2.2 Alternative B – Expand Habitat Management and Enhance Nesting Opportunities**

Alternative B (Figure 2-7) focuses on expanding and improving habitat within the salt ponds for nesting seabirds and shorebirds. The elimination of vast areas of historic nesting and foraging habitat along the California coast has elevated the need to protect and manage nesting areas, such as those on the salt pond levees. Providing viable nesting sites is essential to the recovery of endangered California least tern and threatened western snowy plover.

Under this alternative, nesting habitat for least terns and the other seabirds that nest at the salt works, including gull-billed terns, elegant terns, and black skimmers, which have been identified by the Service as Birds of Conservation Concern, would be enhanced; new nesting opportunities for the western snowy plover would be provided; and various habitat management activities would be implemented to improve habitat quality throughout the Refuge. No changes to the current public use program would occur under this alternative. All other activities and programs currently being implemented on the Refuge as described in Alternative A would continue, including commercial solar salt production.

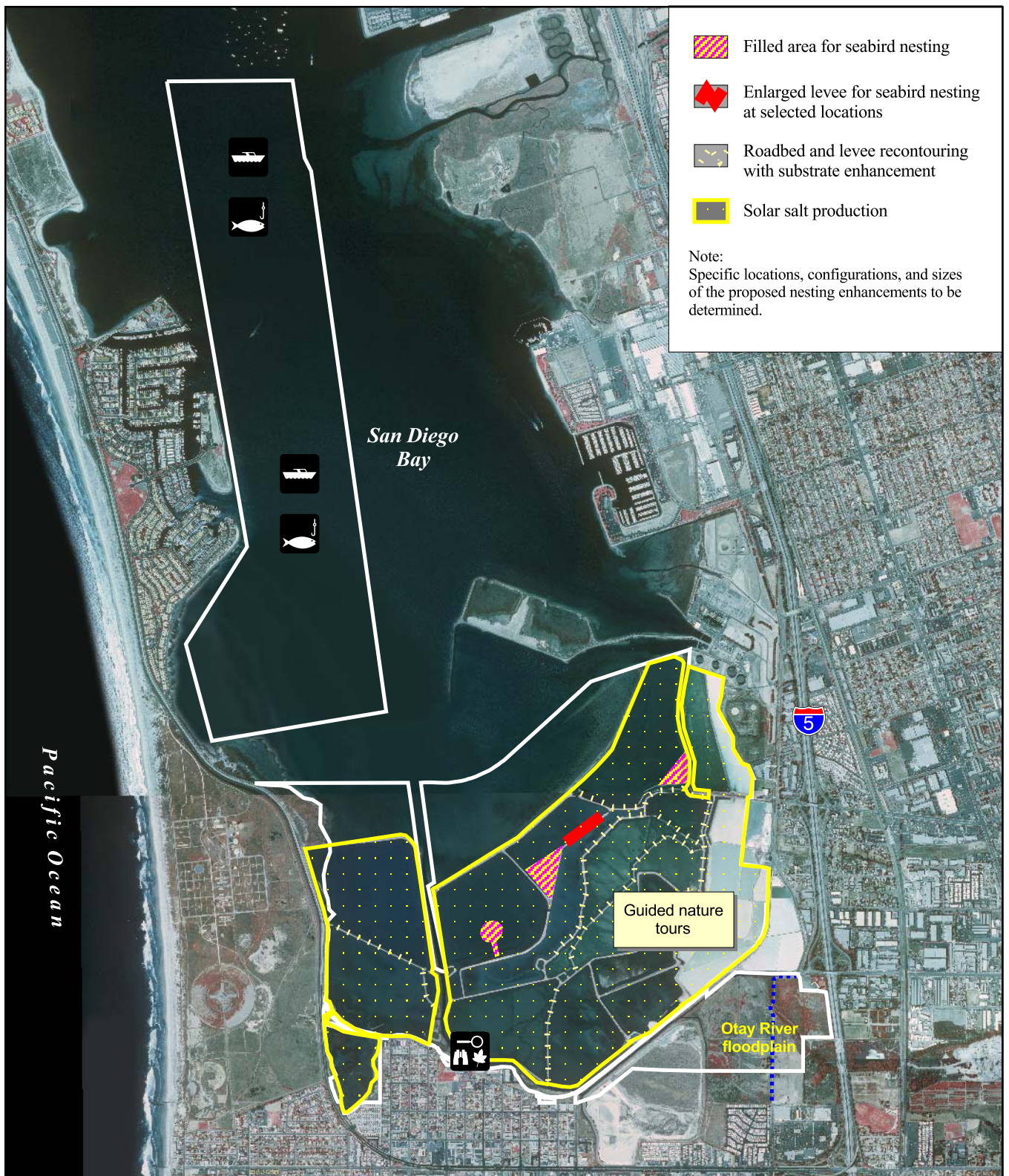
#### **Wildlife and Habitat Management** **Habitat Enhancement**

The management activities proposed to enhance nesting opportunities within the salt works include recontouring some levees to reduce steep side slopes; applying appropriate nesting substrate to the tops of the recontoured levees; and expanding the area available for nesting by widening some levees and filling portions of some ponds. The specific locations of the various enhancement components, the extent of work to be completed, and the final size and configuration of the nest sites would be determined during subsequent step-down planning. In designing these sites, current use patterns, the demonstrated need to improve existing conditions, and an evaluation of optimal habitat values for fish and affected bird species would all be considered. As described in Section 2.3.2.1, some substrate enhancement is being conducted now, but not to the degree envisioned under this alternative.

Recontouring the side slopes of the levees is proposed to improve conditions for chicks, particularly western snowy plover chicks. The steep, eroded side slopes of the levees would be replaced with a maximum 4:1 side slope as shown in Figure 2-8. Improving the side slope gradient would increase foraging access for shorebird chicks and adults, which feed on the brine and benthic invertebrates that occur at the edge of the ponds. Slope recontouring would be accomplished primarily by adding additional soil along the edges of the levees and creating a new slope. In some cases, it may be possible to regrade the existing levees using manual labor or a small tractor to lower and narrow the levee surfaces. The material that is generated would then be used to reshape the side slopes. Once the side slopes have been prepared, a six to twelve-inch layer of light colored sand would be placed on the levee surfaces.

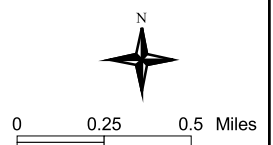
Estimates of the amount of fill material and sand required to recontour those levees depicted in Figure 2-7 is presented in Table 2-5. The estimates were developed based on the assumption that all recontouring would be accomplished using imported fill and are provided to facilitate an analysis of the potential effects of implementation. The actual





**Figure 2-7 South San Diego Bay Unit, Alternative B**

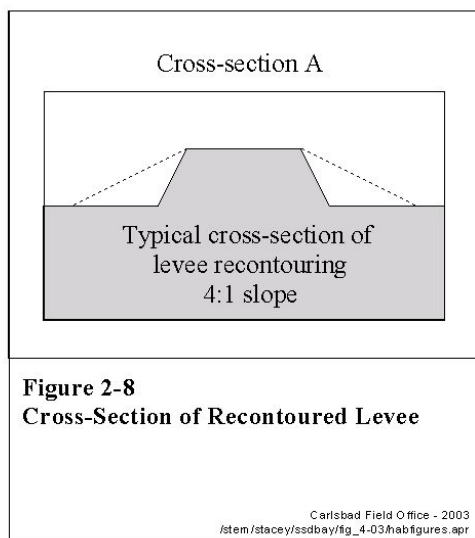
- |   |   |  |
|---|---|--|
|  South San Diego Bay Unit<br>Existing Management Authority |  Boating     |  Environmental<br>education |
|  Fishing   |  Bike path |  |



Source: USFWS, Local Agency Partnership 2000 (2 ft imagery)

Carlsbad Field Office - 2003  
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amount of fill that would be required is dependent upon the elevation and width of the levee top and the elevation in the pond along the base of the levee. Approximately 24,900 cubic yards of imported material would be required if the internal side slopes of all of the primary and secondary ponds within the system were recontoured to create a 4:1 slope (*Ducks Unlimited 2004*). In addition, substrate enhancement of the recontoured levees would require approximately 11,100 cubic yards of imported sand.



As illustrated in Figure 2-7, additional nesting habitat could be provided by expanding existing levees to create wider linear nesting sites and by creating new “island-like” areas within the ponds. The actual locations for these new nesting areas would be determined during subsequent detailed planning.

Levees selected for widening would be analyzed to determine the most efficient design (i.e., a design requiring the least amount of imported fill material) for achieving the desired configuration. The amount of material required to widen the levee segment between Ponds 13 and 14, as illustrated in Figure 2-7, was determined by

assuming that a segment of widened levee would be approximately 1,200 feet long and 40 feet in width. A 4:1 slope would tie in the fill with the existing pond bottom and a six-inch cap of sand would be deposited on the new levee area. Based on these assumptions, approximately 4,600 cubic yards of base fill material and 1,200 cubic yards of sand would be required to widen this levee. Similar volumes would be required to widen other levees within the system.

Table 2-5 Volumes Required to Recontour Select Levee Slopes				
Levee Section Between Ponds <sup>1</sup>	Section Length (linear feet)	Required Fill Material (cubic yards)	Surface Area (square yards)	Capping Material (sand) (cubic yards) <sup>2</sup>
10 and 11	3,000	1,200	6,300	1,100
22 and 23	2,000	2,000	7,500	1,200
14 and 15	2,400	1,700	7,800	1,300
13 and 24	4,200	4,600	15,400	2,600
24/25 and 26/27	7,400	15,400	29,000	4,900
<b>Total</b>	<b>19,000</b>	<b>24,900</b>	<b>66,000</b>	<b>11,100</b>

<sup>1</sup>Locations for these levee sections are illustrated in Figure 2-7.

<sup>2</sup>Assumes sand would be placed on the recontoured levees at a depth of six inches.

Source: Ducks Unlimited 2004

A minimum of 22 acres of new nesting area would be created within the primary ponds. Examples of the types of nesting areas envisioned under this proposal are depicted as “filled areas for seabird nesting” on Figure 2-7. The actual volume of fill required to create these areas would be dependent upon the depth of the pond at the fill site and the size of



the area to be filled. For review purposes, the volume of material required to create the areas depicted in Figure 2-7 were calculated. For each new nesting site, it was assumed that the top elevation of the nesting sites would be 8.5 feet NAVD88 and that the side slopes would be constructed at a slope gradient of 4:1. As indicated in Table 2-6, it would be necessary to import approximately 231,600 cubic yards of material to the site to construct the three new nesting areas (*Ducks Unlimited 2004*). This material would include base material required to create the nesting sites and light-colored sand to cap the base. Due to the limited availability of light colored sand in the region, two substrate depths, six inches and three feet, were calculated for each nest area. If an adequate source of light-colored sand is identified, a greater depth of sand would be desirable as it would be expected to deter vegetative growth and allow for some losses of substrate over time due to wind and water erosion.

Table 2-6 Estimated Volume of Fill Required to Create the New Nesting Areas Illustrated in Figure 2-7						
Location of New Nesting Area	Approximate Pond Elevation (NAVD88)	Fill Area (Acres)	6-Inch Substrate Cap		3-Foot Substrate Cap	
			Base Fill Volume (cubic yards)	Substrate Fill Volume (cubic yards)	Base Fill Volume (cubic yards)	Substrate Fill Volume (cubic yards)
Pond 12	1.5	5.5	52,800	4,400	31,900	25,300
Pond 14	1.3	8.9	86,800	7,200	52,200	41,700
Pond 15	1.5	7.9	74,000	6,400	43,800	36,600
<b>Total</b>	- -	22.3	213,600	18,000	127,900	103,600

(Ducks Unlimited 2004)

The sand covered nesting surfaces would ideally be augmented with seashell fragments. In addition, fencing and gates may be installed along some levees to reduce intrusion into nesting areas by humans and animals.

To further enhance nesting opportunities for the western snowy plover, the water levels in one or a portion of one of the secondary ponds would be drawn down annually at the beginning of the nesting season (March) to provide dry nest sites for the plovers. Little or no alteration of the pond levees or elevations within the pond would be required to achieve the desired conditions.

The pelican roosting enhancements described in Alternative A would also be implemented under this alternative.

#### Construction Methods for Proposed Enhancements

With the exception of the proposals to enhance the nesting substrate on the levee tops and regulate water levels in one of the secondary ponds, the enhancement proposals described above would require detailed engineering plans prior to implementation. The following summary of construction methods has been prepared based on experiences from similar types of enhancement proposals.

Earthwork Methods and Equipment: All aspects of levee enhancement would be accomplished using land based equipment, such as dump trucks, excavators, scrapers, and

bulldozers. Specifically, end dump or side dump trucks would be used to transport materials (soil and sand) to the site and then distribute the materials to the appropriate levees. Prior to the transport of this material out onto the levees, some levees may need to be augmented or stabilized to ensure that loaded trucks pass safely through the area without getting stuck, slipping off, or compromising the structural integrity of the levee. This could require the placement of additional material on some levees and/or the use of soil stabilizing fabric and road base. Some levees may be too narrow to accommodate traditional construction equipment, requiring the use of lighter construction equipment.

Once levees identified for stabilization are augmented and deemed suitable, they can be used to transport material to specific enhancement sites. Equipment, such as excavators, compactors, and/or water trucks, would be staged at the deposition site to accept the material and compact it in place. For levee recontouring or the construction of new nesting areas, turn outs or areas with flat slopes would be constructed to permit equipment to be moved aside allowing trucks to pass once their load has been dropped off.

Prior to widening selected levees, the existing elevations within the ponds on either side of the levee to be widened would be verified and the side with the higher invert elevation would be used as the site of the proposed widening. A typical design for widening assumes that a 40-foot wide bench would be constructed at levee shoulder height and would extend for about 40 feet at a 2 percent slope. A 4:1 slope would tie the fill into the bottom of the pond. This bench would be constructed using the same techniques described above for levee recontouring.

Once a levee has been recontoured or widened, or a new nest site has been constructed, the surface would be capped with sand or ideally with a mixture of sand and shell fragments. This material would be trucked to the site and compacted in place. The low cohesiveness of sand makes it readily erodable, so the capped areas would be periodically monitored to assess the actual rate of wind and wave erosion occurring in these areas.

Construction Access Routes/Staging Areas: Construction access onto the site would vary depending upon the timing of project implementation, as well as the timing of any development proposed in the area immediately adjacent to the Refuge. If development on the private property to the east of the Refuge (the area currently occupied by Ponds 50 through 54) has not yet occurred, the Service would attempt to gain a construction access easement from the property owner that would permit access directly from Main Street onto the Refuge. Alternatively, construction access could be taken through the parcel that includes the salt processing plant via an approved construction access easement from the Airport Authority. Under this option, access would most likely be taken via the existing railroad right-of-way that separates Pond 50 through 54 from the rest of the salt works or from a roadway that follows between Ponds 45 and 46 and is extended through Ponds 47 and 48 to access the railroad right-of-way to the south of the salt ponds. Haul routes located on the Refuge would be established using the existing levee system, with much of the activity focused on the outer levees, which have been constructed to accommodate heavier truck traffic.

With the exception of mobilization and demobilization activities, the majority of the truck traffic using Main Street would be trucks hauling fill material and sand to the Refuge for placement in designated enhancement areas. Stockpiled fill soil and sand would most likely be stored within an existing maintenance area located to the southeast of Pond 20.

**Construction Phasing:** Enhancement activities could occur over a one to two-year period and would be scheduled to avoid nesting impacts during the breeding season (late September through February). In some circumstances, construction that does not disturb nesting birds may continue year-round. The extent of work completed each year would vary depending upon the weather conditions in a given year and funding availability.

### **Habitat Protection**

Under this alternative, patrol of the Refuge would be expanded to include periodic patrol of Refuge waters in an effort to minimize the effects of human disturbance on nesting seabirds, migrating shorebirds, and wintering waterfowl. A 5 mph “no wake” speed limit has been established for much of the South Bay. It is currently enforced by the Port’s Harbor Patrol; however, enforcement within the Refuge boundary is limited. No patrol by Refuge staff is currently conducted. As a result, boats and personal watercraft are often observed exceeding the posted speed limit. Excessive speed can flush wintering waterfowl and seabirds that are rafting on the open bay and disturb shorebirds loafing along the shoreline. Under this alternative, Refuge staff, working in cooperation with the Harbor Patrol, would patrol the open waters of the Refuge to enforce the speed limit. This would require the acquisition of a patrol vessel and trailer.

### **Habitat Management**

In addition to the habitat management activities described in Alternative A, this alternative includes a proposal to control accumulated fishing line and other debris within the Refuge by implementing a Monofilament Recovery and Recycling Program (MRRP) modeled after the MRRP developed by the Florida Fish and Wildlife Conservation Commission. The purpose of the program is to educate the public about the problems caused by monofilament fishing line left in the environment, to encourage recycling through a network of line recycling bins and drop-off locations, and to conduct volunteer monofilament line cleanup events. Discarded fishing line represents a serious threat to fish eating birds, shorebirds, and colonial nesting seabirds. Birds can become entangled in discarded fishing line, resulting in serious injury and death. On various occasions, monitors on the Refuge have discovered several dead or dying birds entangled in one length of fishing line within the seabird nesting colonies on the salt pond levees. Other discarded materials, such as various forms of plastic, can also result in injury or death for a variety of bird species, and also pose a threat to the Bay’s population of Federal threatened Eastern Pacific green sea turtles (*Chelonia midas*).

To reduce this threat to the Refuge’s wildlife, the MRRP would include a public outreach component to encourage anglers to recycle their used fishing line at tackle shops and outdoor bins, while also initiating periodic cleanups along the tidal flats and upper marsh areas of the Refuge. Efforts would also be made to have the MRRP extend beyond the refuge boundary through partnerships with surrounding municipalities, the Port, and appropriate State agencies, such as the California Department of Fish and Game.

### **Public Use Program**

The Refuge’s current public use program, as described for Alternative A, would remain unchanged under this alternative.

### **Other Uses**

**Solar Salt Production:** Commercial solar salt production would continue under this alternative. Some minor changes to the salt ponds would occur as a result of the proposed

nesting enhancements. Additional restrictions or controls beyond those already in place for the existing salt operation could also be implemented, such as the closure of additional access routes during the nesting season, altering current dredging practices, and any other actions as needed to protect the wildlife resources within the salt ponds.

### **Environmental Contaminants**

Under this alternative, funding would be sought to implement the recommendations included in the CAP (refer to Alternative A).

### **Cultural Resource Management**

Under this alternative, the Refuge Manager would seek funds to complete a cultural resource survey for the Refuge. All resources that are identified would be recorded, inventoried, and evaluated for eligibility to the NRHP. As described in Alternative A, a request for cultural resource compliance will be forwarded to the Service's Cultural Resources Team prior to implementing projects that involve ground disturbing activities. When deemed appropriate by the Cultural Resources Team, consultation with the SHPO and interested parties would be conducted.

### **Refuge Facilities**

Under this alternative, additional fences and gates may be installed to protect nesting areas. In addition, temporary construction access roads could be constructed to provide access to the salt pond levees to implement proposed enhancement projects. No permanent Refuge buildings are proposed. As described in Alternative A, agreements to achieve long-term access rights onto the Refuge from the east would be pursued.

### **Step-Down Management Plans**

#### **Fire Management Plan**

The Fire Management Plan described in Alternative A is also proposed under this Alternative (refer to Alternative A for more information).

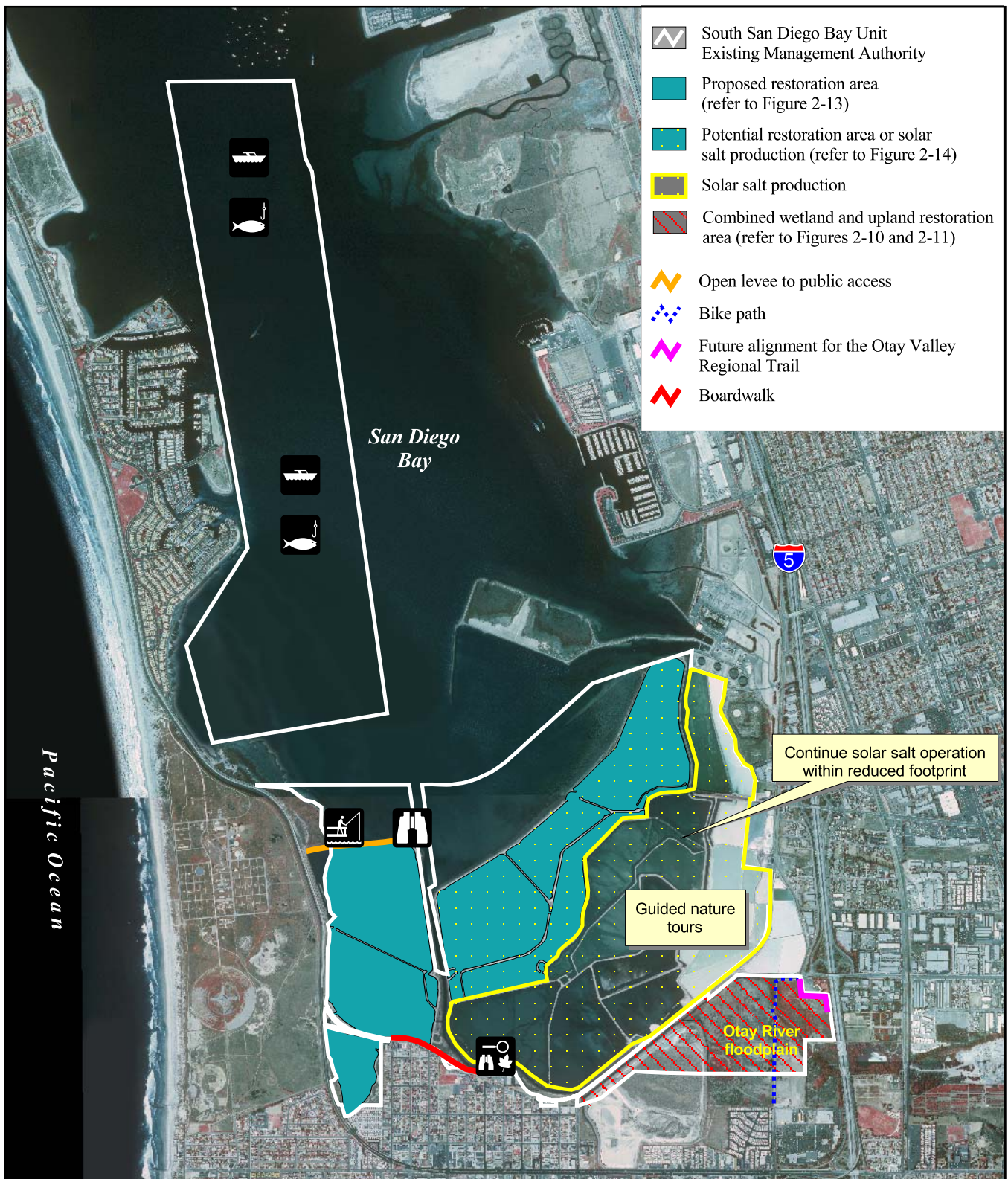
#### **Predator Management Plan**

Under this alternative, predator management activities on the South San Diego Bay Unit would be the same as those described under Alternative A of the Sweetwater Marsh Unit and addressed in detail in Appendix M.

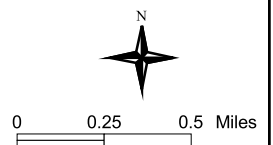
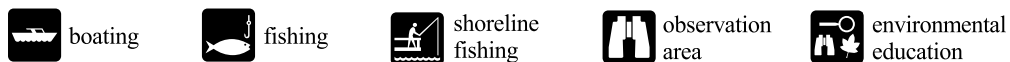
### **2.3.2.3 Alternative C – Expand Habitat Management, Enhance Nesting Opportunities, Implement Habitat Restoration, and Expand Existing Public Use Opportunities**

Under Alternative C (Figure 2-9), management activities would be increased to include several habitat restoration proposals, with the intent of expanding those habitats on the Refuge that support listed species. The proposals reflect the need to restore the variety of coastal habitats that have been lost to development in California, and particularly in San Diego Bay, over the past 140 years. Within California, it is estimated that 80 percent of the historic coastal wetlands have been destroyed to accommodate development. Locally, approximately 42 percent of San Diego Bay's shallow water habitat, 84 percent of its intertidal mudflats, and 70 percent of its salt marsh habitat have been filled or dredged to accommodate port uses and associated development (*SDUPD 2000*).

Specific proposals include restoring some salt ponds to tidal influence and excavating portions of the Otay River floodplain to restore intertidal habitat, which historically occurred here. The restoration of intertidal habitat, particularly cordgrass-dominated salt marsh habitat, is intended to benefit the light-footed clapper rail and other avian species, while also expanding the area



**Figure 2-9**  
**South San Diego Bay Unit, Alternative C**



Source: Local Agency Partnership (2 ft imagery, year 2000)

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available to support a variety of fish and benthic invertebrate species. This alternative also proposes to restore native upland and freshwater wetland habitats in the eastern portion of the Otay River floodplain. If implemented, this alternative would result in the restoration of up to 140 acres of intertidal salt marsh, freshwater wetland, and coastal sage scrub habitat within the Otay River floodplain. In addition, up to 410 acres of salt ponds would be restored to intertidal salt marsh habitat.

Opportunities for fishing and wildlife observation would be expanded under this alternative. Solar salt production would continue, but within a reduced footprint.

### **Wildlife and Habitat Management**

This alternative includes the wildlife and habitat management activities described in Alternatives A and B, as well as the additional activities presented below.

### **Habitat Restoration**

This alternative includes two restoration options for both the Otay River floodplain and two restoration options for the salt ponds. These options were developed to allow the Service to fully evaluate the opportunities and constraints of restoring these areas, as well as to present a range of feasible alternatives for evaluation under NEPA. Although the options presented would all achieve the wildlife goals of the Refuge, they each reflect different objectives and strategies for meeting these goals. The specific objectives and strategies associated with these restoration options are presented in Section 2.3.5. Final restoration and engineering plans needed to implement the restoration proposals described under this alternative would be prepared during subsequent step-down planning. It is during this phase of restoration planning that the various studies and additional modeling described below would be conducted.

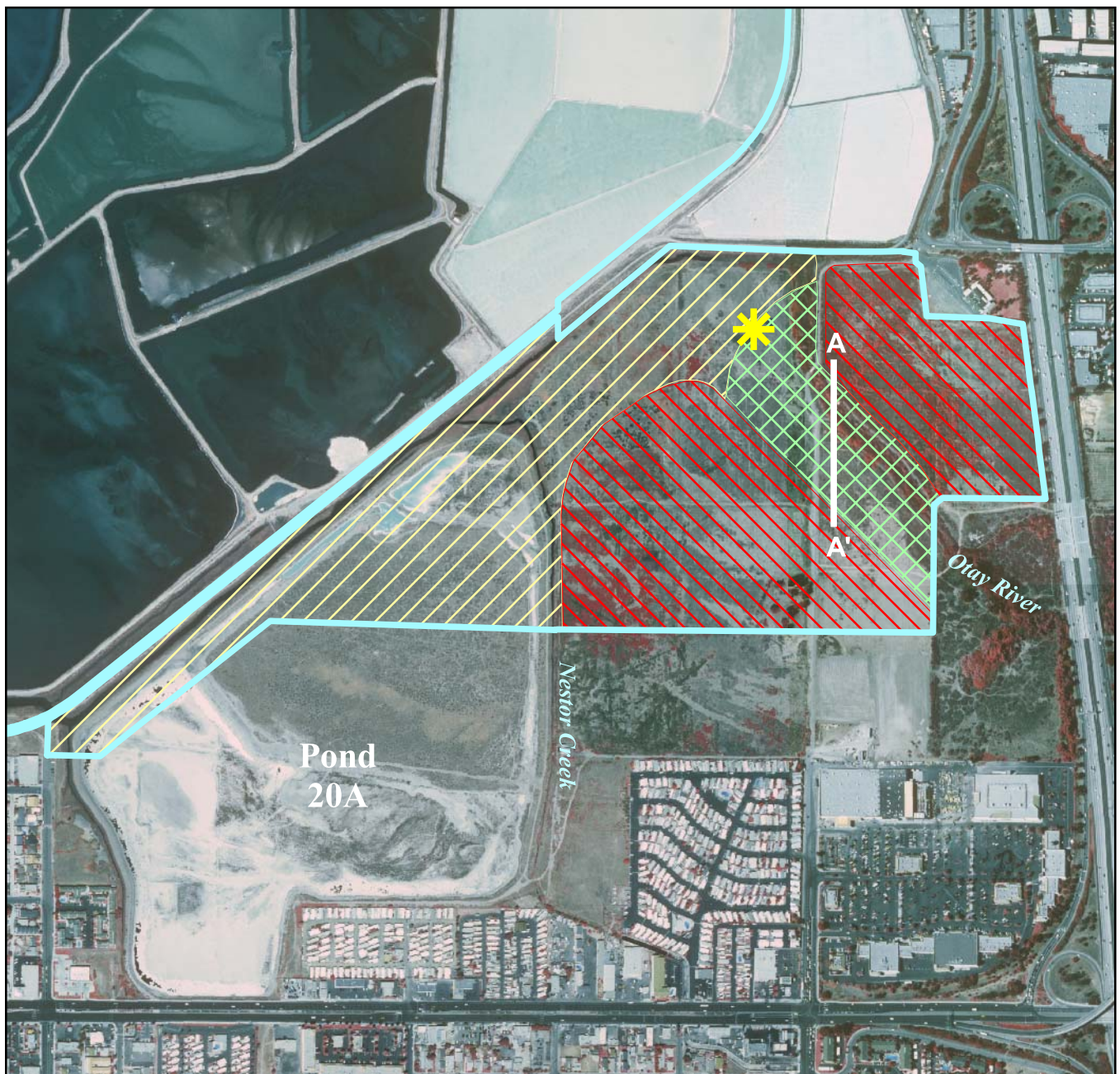
### **Otay River Floodplain Restoration Option 1 and Restoration Option 2**

The two restoration options developed for the Otay River floodplain are intended to increase the availability of coastal salt marsh habitat for listed species and migratory birds, as well as enhance and restore freshwater wetland and native upland habitat to support the Refuge's native wildlife and plant species. Each of these restoration options would restore approximately 140 acres within the Otay River floodplain to native habitat, but the total acreage of each habitat would be different under each option.






Restoration Option 1 would result in approximately 60 acres of intertidal wetlands, 20 acres of freshwater wetlands, and 60 acres of native uplands, while Restoration Option 2 would provide approximately 90 acres of intertidal wetlands, 15 acres of freshwater wetlands, and 35 acres of native uplands. A more detailed breakdown of the habitats to be restored is provided in Table 2-7.

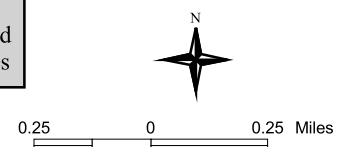
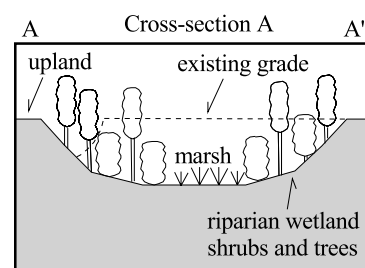
Otay River Floodplain Restoration Option 1 – Expanded River Channel: This restoration option (Figure 2-10) focuses on providing a balance between wetland and upland habitats, with approximately 60 acres to be restored to native upland habitat and about 60 acres to be restored to salt marsh and intertidal mudflats. In addition, the freshwater wetland restoration component of this option would focus on restoring riparian habitat along an expanded Otay River channel. This mix of habitats would support a range of wildlife and plant species, some of which are not currently present on the Refuge, such as least Bell's vireo (*Vireo bellii pusillus*), California gnatcatcher, and salt marsh bird's beak.





**Figure 2-10**  
**South San Diego Bay Unit, Alternative C - Otay River Floodplain Restoration Option 1**

-  Refuge management boundary
-  Freshwater wetland  
(30% marsh and 70% riparian)
-  50% intertidal mudflat,  
30% cordgrass, 20% pickleweed
-  Restored uplands
-  Transition from freshwater wetland  
to salt marsh



Source: USFWS, Local Agency Partnership 2000 (2 ft imagery)

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Table 2-7 Habitat Acreages for Alternative C - Otay River Floodplain Restoration Options						
Otay River Floodplain Restoration Options	Habitat Type (Acres)					
	Tidally Influenced Wetlands			Freshwater Wetlands		Restored Upland
	Intertidal Mudflat (50%) <sup>1</sup>	Cordgrass (30%)	Pickleweed (20%)	Marsh	Riparian	
Option 1 – Expanded River Channel	31	19	13	6 (30%) <sup>2</sup>	13 (70%) <sup>2</sup>	61
Option 2 – Expanded Tidal Wetlands	44	26	18	12 (70%) <sup>2</sup>	5 (30%) <sup>2</sup>	38

<sup>1</sup> Percent of total area to be restored to tidally influenced wetlands.

<sup>2</sup> Percent of total area to be restored to freshwater wetland.

Restoration under this option would: 1) restore intertidal mudflat and salt marsh habitat along the northern third of Pond 20A; 2) restore coastal sage scrub and maritime succulent scrub habitats on the remaining upland areas near the eastern boundary of the Refuge; and 3) expand freshwater wetland habitat along the Otay River channel by widening the existing channel along its present alignment.

To restore freshwater wetland habitat, the Otay River channel would be widened to the south of the existing channel by up to 656 feet (200 meters). The new floodway would be contoured to create gentle slopes along the channel edge to support wetland habitat types ranging from freshwater marsh at the lowest elevations to riparian woodland near the top of the slope (refer to Cross-section A in Figure 2-10). Implementation of this restoration option would restore approximately 20 acres of freshwater wetland habitat, with about 30 percent of this acreage supporting freshwater marsh habitat and 70 percent supporting riparian habitat. In the western reach of the river, the habitat would be influenced by tidal action, resulting in a transition from freshwater wetland to salt marsh.

Restoration of salt marsh habitat would involve removing the levee along the northern and northeastern edge of Pond 20A within the Refuge boundary and excavating the land behind the levee to achieve an elevation range of between +0.4 feet NAVD88 at the northern edge of the pond to +5.1 feet NAVD88 at the southern Refuge boundary. The intent is to create approximately 60 acres of marsh plain by grading the area to elevations known to support a range of intertidal habitat types. The proposed mix of habitats would consist of 50 percent intertidal mudflat, 30 percent cordgrass-dominated salt marsh, and 20 percent pickleweed-dominated salt marsh. Under this option, a new levee could be constructed within Pond 20A along the southern Refuge boundary or the area could be graded to meet the existing grade at the property line (daylight graded). The latter would require coordination with and approval by the Port, which owns the southern portion of Pond 20A.

To achieve the desired wetland habitats, approximately 725,000 cubic yards of material would be excavated from the site. Depending upon the soil characteristics, grain size, and other factors, this material could be exported from the site; placed on those areas of the

site proposed for upland restoration; used to construct the levee that would be relocated to the southern Refuge boundary in Pond 20A; and/or used to restore and enhance habitat within the salt ponds, as will be described later in this section. The construction activities required to implement restoration within the Otay River floodplain are described later in this chapter under the section “Construction Methods for Restoring the Otay River Floodplain.”

The proposed restoration of native upland habitat would occur in two locations: a 22-acre site located to the east of the Otay River channel and a 39-acre site located to the east of Nestor Creek and to the west of the Otay River channel. Prior to restoration, these upland areas could be used as disposal sites for material generated during excavation of the proposed wetland areas. Preliminary estimates indicate that all of material generated during excavation to accommodate the restoration of intertidal wetland habitat (approximately 723,000 cubic yards of material) could be disposed of on these sites. This would raise the elevation of the sites by approximately eight feet. Slopes around the perimeter of these sites would not exceed a gradient of 4:1 and would be contoured to produce a more natural appearance. Assuming these two upland areas are used as disposal sites, the material placed on these sites would be compacted as appropriate for restoration and then revegetated using a combination of native seed mixes and container stock. The specific plant palettes, temporary irrigation plans, and maintenance and monitoring criteria for these restoration sites would be developed in association with the completion of final engineering planning for the overall project.

Otay River Floodplain Restoration Option C2 – Expanded Tidal Wetlands: Although similar in some respects to Option 1, Restoration Option 2 (Figure 2-11) focuses on maximizing salt marsh restoration in support of the light-footed clapper rail and other avian species that are dependent upon intertidal habitat for survival. In addition to salt marsh habitat, this restoration option would also result in the restoration of freshwater wetland and native upland habitat.

To restore salt marsh habitat, the levees within the Refuge boundary that occur to the south of the Otay River, as well as along a portion of Nestor Creek would be removed. Extensive portions of the floodplain would be excavated to create a sloping marsh plain, with elevations along the southern edge of the Otay River channel at about +0.4 feet NAVD88 gently rising to about +5.1 feet NAVD88 at the southern Refuge boundary.






Implementation of this restoration option would restore approximately 90 acres of marsh plain, consisting of approximately 50 percent intertidal mudflat, 30 percent cordgrass-dominated salt marsh, and 20 percent pickleweed-dominated salt marsh habitat. As in Option 1, the existing levee along the top of Pond 20A could be relocated to the southern Refuge boundary or if the levee is not related, the grading necessary to create intertidal habitat would daylight at the property line. Grading along the southern property line to the east of Nestor Creek would involve excavating a 4:1 slope from the existing grade down to high salt marsh (an elevation of approximately +6.4 feet NAVD88).

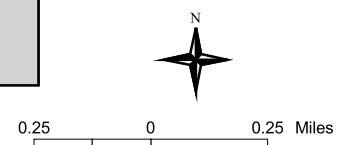
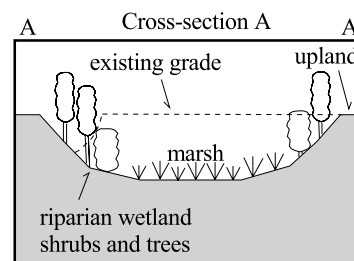
The site’s current freshwater wetland habitat would be expanded by excavating a 15-acre upland area to the east of the existing bike path (refer to Figure 2-11). A pilot channel would be constructed due west from the point where the river channel currently enters the Refuge along the eastern boundary to a point where the pilot channel would empty into the graded marsh plain. This pilot channel is intended to direct larger storm flows from the Otay River through the center of the property, rather than through the existing undersized





**Figure 2-11**  
**South San Diego Bay Unit, Alternative C - Otay River Floodplain Restoration Option 2**

-  Refuge management boundary
-  Freshwater wetland  
(70% marsh and 30% riparian)
-  50% intertidal mudflat,  
30% cordgrass, 20% pickleweed
-  Restored uplands
-  Transition from freshwater wetland  
to salt marsh



Source: USFWS, Local Agency Partnership 2000 (2 ft imagery)

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channel that extends north and then west along the edge of the salt works. This new pilot channel would support freshwater habitat east of the Saturn Boulevard bike path, but would transition to salt marsh habitat west of the bike path where the area would be excavated to an elevation of approximately +3.4 feet NAVD88. The area proposed for freshwater wetland would be designed to maximize freshwater marsh habitat. Approximately 70 percent of the area to be restored to freshwater wetland would be restored to freshwater marsh habitat and 30 percent to willow scrub habitat (refer to Cross-section A in Figure 2-11).

To achieve the desired wetland habitats, preliminary estimates indicate that approximately 970,000 cubic yards of material would be excavated from the site. All or a portion of this material could be exported from the site; placed on those areas of the site proposed for upland restoration; used to construct a new levee along the Refuge's southern boundary within Pond 20A; and/or used to restore and enhance habitat on within the salt ponds.

A smaller area of upland habitat would be restored under this option, with 22 acres proposed for upland restoration to the east of the Otay River channel and 16 acres proposed for an area located immediately to the west and south of the existing channel. An appropriate mix of habitats, including upland transition, coastal sage scrub, and maritime succulent scrub, would be restored in this area, with the specific plant palette, temporary irrigation plans, and maintenance and monitoring criteria to be developed in association with the completion of final restoration plans for the overall restoration proposal.

As described for Option 1, these upland areas may be used as a disposal site for material generated from the excavation of adjacent wetlands prior to restoring native upland habitat. If all of the excavated material (970,000 cubic yards) were to be placed on the proposed upland areas, the surface elevation of the sites would be raised by approximately 18 feet. To avoid any significant adverse effects related to visual quality, these sites would be raised no more than 8 feet in elevation (which would result in the disposal of approximately 460,600 cubic yards of material under Option 2). All remaining material would be used to reconstruct levees along Pond 20A and Nestor Creek, to enhance nesting areas, to raise pond elevations to accommodate appropriate habitat types, and/or be removed from the site to an approved disposal area. The actual method of disposal would be determined during the completion of final engineering and design and would take into consideration the soil characteristics of the excavated material, the restoration option ultimately chosen for implementation, and a review of pertinent environmental constraints. The construction methods to be implemented during restoration are described below.

#### Construction Methods for Restoring the Otay River Floodplain

Implementation of either restoration options presented for the Otay River floodplain would require the development of detailed engineering plans and a full description of construction and revegetation methods. Once these details are available, additional analysis under NEPA may be required to address potential environmental consequences not anticipated in this document. The following summary of construction methods has been prepared using information obtained from similar types of restoration proposals.

**Earthwork Methods and Equipment:** Construction would begin following the completion of any required remediation of contaminated soils on the site (refer to Section 3.3.8). Once contaminants issues have been appropriately addressed, the construction access routes would be graded and the construction staging area prepared. One or more temporary

access bridges would be installed to provide access from the restoration site to Main Street via the southern levee access road on the salt works. The area to be excavated and restored to wetlands would then be cleared of existing vegetation. If the project is to be implemented in phases, clearing would also be implemented in phases to reduce the potential for erosion and downstream sedimentation.

Earthwork equipment for this project can be classified into two main categories: land-based equipment, such as excavators, dump trucks, scrapers, and bulldozers, and floating equipment, such as dredges. Both land-based and floating equipment have specific inherent advantages and disadvantages. The method selected would depend upon site specific conditions, such as the ability to de-water; whether material is being imported to the site or relocated within the site; where borrowed material is removed; and where the borrowed material is to be deposited. Similarly, for each category the type of equipment used depends upon the same factors (such as using a scraper versus using the combination of an excavator and dump truck).

Land-based equipment is primarily used to relocate large quantities of material within a site or to haul material to an offsite upland location. Borrow and fill areas must be dry enough to permit a scraper to operate without getting stuck. If fill areas are too wet, it may be necessary to deposit excavated material on an area nearby where it can be stockpiled and then moved to the fill site using more appropriate equipment. The main advantage of scrapers is that they are self-loading. This allows multiple pieces of equipment to be in production without waiting for their turn to be loaded. Draglines and excavators are best suited for excavating trenches or pulling material out of wet areas where scrapers cannot operate. Excavators are always preferred over draglines. The latter is only used if the required reach is in excess of 50 feet. Excavators can be placed on mats that decrease the pressure they exert on the soil enabling them to access sites such as a wet marsh. Low ground pressure dump trucks are also available that can be used in wetter areas. Normally, excavators are used in conjunction with trucks for transportation of the material, although if the material is allowed to dry, scrapers could be used as well. Excavators can also be placed on barges and used as a dredge (*Ducks Unlimited 2004*).

Land-based equipment comes in a large range of sizes. The larger equipment obviously has the ability to move more earth in a given time period, but also requires more effort to mobilize. In addition, the size of equipment that can be utilized is governed by the ability of the site conditions to support it. Land-based equipment normally includes a motor grader to cut and maintain haul roads, along with a water truck to control dust.

Floating equipment includes hydraulic dredges and mechanical dredges, such as clamshells. The latter are normally used to excavate underwater trenches or to remove material in areas where other equipment is unable to operate. The excavated material must be mechanically handled to move it off of the dredge and to its final destination. This multiple handling of material increases costs and reduces the removal efficiency. Hydraulic dredges are designed for moving vast amounts of material over relatively large distances. If the conditions warrant their use, the hydraulic dredge is by far the most efficient method of relocating material. This is primarily due to the sheer volume of material moved. Further, because the material is pumped, it does not have to be handled more than once to get it to its final destination. If dredge spoils are intended for use as structural fill, they must be allowed to dry for some time before they are re-worked and compacted into place (*Ducks Unlimited 2004*).



Hydraulic dredges are also available in a variety of sizes. The advantage of smaller dredges is that they can operate in shallower water depths. The disadvantage is that they move less material in a given time and over shorter distances. Booster pumps can be placed in the discharge lines of smaller dredges to increase the distances the slurry is pumped. Conversely, if an area can be located or excavated where a larger dredge can get started, it can work its way through a shallow pond by cutting its own channel. Dredges must have an ample supply of water to operate effectively.

Dredges operate by cutting into the mud and mixing it with ambient water to create a slurry consisting of roughly 10 to 20 percent solids. The advantage that this has over other methods of dredging is that once the mud is slurred it usually is self-leveling and will run flat when discharged. The discharge can be placed on uplands with a water return plan or discharged into another water body. Dredging operations often run 24-hours a day to eliminate the lengthy start-up and shutdown procedures.

Excavation in the Otay River floodplain would most likely be accomplished using land-based equipment. The equipment would mobilize into the farthest reaches of the work area and retreat as the material is removed. Using backhoes, scrapers, and other land-based equipment, the construction site would then be excavated down to elevations appropriate for supporting the desired habitat types shown on the restoration plans.

It would be possible to excavate the material for the proposed intertidal areas using a hydraulic dredge, but this would only be practical if a temporary weir could be constructed across the river channel that would maintain a specified minimum water level within the work area. The advantage of the weir would be that any sediment plume created by the work would be maintained within the site. In addition, the excavated material could be pumped directly to its destination site, be it uplands within the floodplain or fill areas within the salt works. This would reduce the duration of construction by eliminating double handling of the material. Water could, however, be a limiting factor. The advantages and disadvantages of using a hydraulic dredge to implement restoration in the Otay River floodplain will be evaluated further when detailed restoration plans are prepared for this area.

Construction Access Routes/Staging Areas: Daily construction traffic would enter and exit the site via Main Street in Chula Vista. This would require the placement of a temporary bridge across the drainage channel that extends west from the freeway along the south side of Main Street and/or across the Otay River channel at a point west of the existing bike path. Construction traffic would only be permitted to enter the site from Saturn Boulevard during project mobilization and demobilization, which would involve only a few days at the beginning and end of the project or project phases. Primary construction access routes and proposed staging areas for the various restoration proposals would be contained within the Refuge Unit. A system of circular haul roads would be created to ensure the most efficient method of transporting material within the site and possibly to the salt works. Adequate room would be provided at the excavation and fill sites for efficient operation of equipment, such as compactors, excavators and water trucks.

The primary construction staging area would be located on the disturbed uplands west of the extension of Saturn Boulevard on Refuge property. Temporary fencing would be placed around the perimeter of the staging area to address security and safety issues.

Disposal Methods: As described previously, excavated material could be disposed using several methods, depending upon the soil characteristics, grain size, and other factors. The most likely method would be on-site disposal involving placement of material on areas proposed for upland restoration, use of some of the material to construct a new levee along the southern Refuge boundary in Pond 20A, and/or used to restore and enhance habitat within the salt works, as will be described later in this section.

Other disposal options that are not currently being considered include deep water ocean disposal and off-site disposal via truck or rail to approved development projects or landfills in the region.

Construction Phasing: The time required to complete the proposed restoration projects could be affected by a number of variables, including site conditions; type, size and numbers of equipment used; hours of operation; weather; the availability of materials or opportunities for disposal; and/or seasonal work stoppages related to the avoidance of impacts during the nesting season. Moderately-sized land-based equipment would be used to excavate the Otay River floodplain under Options 1 and 2. Two time estimates were developed for each option. One estimate assumed the use of only excavators, with five excavators each moving 500 to 1,000 cubic yards per day. The other estimate assumed that a combination of five excavators and 12 scrapers would be used, with the scrapers operating during the initial phases of the project to remove the upper layer of soil.

Based on the assumption described above and assuming construction would proceed with no stoppages, it would take approximately five to 10 months to complete the grading required for Restoration Option 1 using only excavators. If a combination of scrapers and excavators are used, the project would likely take from three to seven months to complete. Using these same assumptions, it would take approximately seven to 10 months to complete the grading required for Restoration Option 2 using only excavators and five to 10 months using a combination of scrapers and excavators. Additional time would be required for planting; installation of erosion control measures, fencing, signage and/or temporary irrigation lines; and any other activities associated with restoration. It is likely that construction would begin with tidal restoration of the western portion of the planning unit, followed by restoration of the eastern end of the floodplain.

Temporary Closure and/or Rerouting of the Saturn Boulevard Bike Path: The grading activity proposed in the Otay River floodplain to implement restoration would require the temporary closure and/or realignment of the existing bike path that extends north/south from Main Street south to the paved section of Saturn Boulevard to the south of the Refuge. Any temporary or permanent changes to the bike path alignment would require coordination with and approval by the City of San Diego.

#### Salt Works Restoration Option 1 and Option 2

Two restoration options have also been developed and evaluated for the salt ponds, with each proposing to restore tidal influence to some portion of the existing pond system. The proposed restoration is intended to provide additional habitat for an array of migratory birds, particularly the endangered, threatened, and special status species that utilize the salt ponds seasonally or on a year round basis. Under Salt Works Restoration Option 1, approximately 200 acres of intertidal wetlands would be restored, while approximately 440 acres of intertidal wetlands would be restored under Option 2. A more detailed breakdown of the habitat types that could be restored under each option is presented in Table 2-8.

The actual mix of habitat types, including tidal channels, unvegetated mudflats, and

cordgrass and pickleweed-dominated salt marsh, would be determined during subsequent detailed restoration planning. The implementation of either of these options would require some reconfiguration of the remaining ponds to facilitate a reduced commercial solar salt operation.

<p><b>Table 2-8</b>  <b>Habitat Acreages for</b>  <b>Alternative C - Salt Works Restoration Options</b></p>								
Alt. C – Salt Works Restoration Options	Habitat Type (Acres) <sup>1</sup>							
	Shallow Subtidal Habitat	Intertidal Mudflat	Salt Marsh (Cordgrass dominated)	Salt Marsh (Pickleweed dominated)	<u>Levees Around Restored Ponds</u>	Potential Nesting Area		Active Salt Ponds <sup>3</sup>
						New	Enhanced Levees <sup>2</sup>	
Option 1 - Restored Western Ponds	13	11	163	10	<u>30</u>	18	variable	815
Option 2 - Restored Primary Ponds	32	95	297	16	<u>75</u>	18	variable	519

<sup>1</sup> These acreage figures are subject to change during detailed restoration planning and are provided here to facilitate the analysis of potential impacts as a result of manipulating existing pond elevations and restoring tidal influence to various salt ponds.

<sup>2</sup> The actual acreage of enhanced levees would be determined during final restoration planning

<sup>3</sup> These acreage figures include the levees and open water areas of the active salt ponds.





Prior to final restoration planning, substrate analyses of pond sediments and the material to be excavated from the Otay River floodplain would be completed to determine the suitability of the sediments for salt marsh restoration. This analysis would consider factors such as grain size, salinity levels, organic content, and availability of nutrients. An investigation would also be conducted to characterize the extent and type of contamination, if any, within the areas to be excavated. If remediation is required, it would be conducted prior to or in association with restoration.





The restoration options proposed for the salt works would be compatible with either of the two restoration options described above for the Otay River floodplain. A complete description of each of the salt works restoration options is presented below.

Salt Works Restoration Option 1 – Restored Western Ponds: This restoration option emphasizes the restoration of cordgrass-dominated salt marsh (Figure 2-12) to support the endangered light-footed clapper rail. Tidal channels and associated tidal flats would be incorporated into these salt marsh areas to provide a variety of microhabitats and foraging areas to support an array of wetland species. Existing nesting habitat for seabirds would continue to be protected and enhanced, as described in Alternative B, and habitat for brine invertebrates would continue to be provided within a reduced solar salt production area. Any pelican roosting platforms located in ponds to be restored would be moved to other ponds within the system.



**Figure 2-12**  
**South San Diego Bay Unit, Alternative C**  
**Salt Works Restoration Option 1**

-  Levee breach or water control structure (subject to relocation)
-  Filled area for seabird nesting
-  Enlarged levee for seabird nesting at selected locations
-  Roadbed and levee recontouring with substrate enhancement

-  Proposed salt production
-  Intertidal mudflat
-  Cordgrass
-  Salt marsh

Note:

1. Ponds would be graded to optimize cordgrass habitat for the Light-footed Clapper Rail.
1. Pond elevations could be altered to achieve desired habitat types.
2. Specific locations and sizes of proposed seabird nesting improvements to be determined.
3. A reduction in the existing salt operation would occur.
4. Restoration of the northwest corner of Pond 11, which is owned by the U.S. Navy, would require approval from the Navy prior to implementation.



0.25 0 0.25 Miles

Source: USFWS, Local Agency Partnership 2000 (2 ft imagery)

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Under this restoration option, the ponds located to the west of the Otay River channel (Ponds 10, 10A, and 11) would be breached, restoring tidal influence to approximately 200 acres of salt ponds. (Coordination with the Navy would be required during detailed restoration planning to address potential changes to the northwestern corner of Pond 11, which is owned by the Navy.) The portions of the levees not affected by breaching would be maintained to provide roosting and nesting habitat for various avian species.

Prior to breaching, the western ponds would be drained by closing the tide gate and allowing much of the water within the ponds to flow further into the salt production system. This would further concentrate the salt contained in the water column and allow it to be harvested from the system in the crystallizer ponds. Once the majority of the water has been removed from the ponds, they would be graded and recontoured to achieve the desired intertidal habitats, including cordgrass-dominated salt marsh habitat. To achieve the desired elevations, which for cordgrass habitat is between +2.86 feet NAVD88 and +3.86 feet NAVD88, appropriate fill material would be placed in Pond 11 to raise the existing elevation. Material would have to be removed from Ponds 10 and 10A to lower the existing elevation. Excess material from Ponds 10 and 10A would be moved to Pond 11. Under the preliminary design illustrated in Figure 2-12, approximately 165,200 cubic yards of additional material would have to be imported into Pond 11 to achieve an average elevation of +3.4 feet NAVD88. The estimated cut and fill volumes required to achieve the desired pond elevations in Ponds 10, 10A, and 11 are presented in Table 2-9. The earthwork calculations assumed elevations that represent the outer limits of the habitat range for each habitat type considered. Therefore, to achieve a better grading balance throughout the restored ponds, the final engineering plans may include additional cut or additional fill in certain ponds and still maintain the desired habitat goals. For example, by excavating the ponds to the lower end of the habitat ranges, more cut material would be generated for use elsewhere in the system, thus reducing the quantity of fill material required to achieve the desired restoration goals.

<b>Table 2-9</b> <b>Estimated<sup>1</sup> Cut and Fill Volumes<sup>2</sup></b> <b>for Obtaining the Elevations Proposed Under Salt Works Restoration Option 1</b>										
Pond #	2.9 feet NAVD88 (intertidal mudflats)			3.4 feet NAVD88 (cordgrass-dominated salt marsh)			3.9 feet NAVD88 (pickleweed-dominated salt marsh)			Pond Net
	Cut	Fill	Net	Cut	Fill	Net	Cut	Fill	Net	
10	(2,600)	100	(2,500)	(77,300)	700	(76,600)	(6,400)	300	(6,100)	(85,200)
10A	-	-	-	(20,800)	0	(20,800)	-	-	-	(20,800)
11	-	-	-	(1,200)	272,500	271,300	(100)	-	(100)	271,200
Total	(2,600)	100	(2,500)	(99,300)	273,200	173,900	(6,500)	300	(6,200)	165,200

<sup>1</sup> Volumes are based on preliminary restoration plans and should not be viewed as specific values.

<sup>2</sup>All volumes are presented in cubic yards.





Once the desired elevations have been achieved, the pond levees would be breached to introduce tidal action into the ponds. The size of the breach would range from 15 to 30 feet in length. All of the affected ponds could be breached in one season, or breaching could be phased over several years.





Salt Works Restoration Option 2 – Restored Primary Ponds: Under this restoration option (Figure 2-13) all of the primary ponds within the system (Ponds 10A and 10 through 15)





**Figure 2-13**  
**South San Diego Bay Unit, Alternative C**  
**Salt Works Restoration Option 2**

-  Levee breach or water control structure (subject to relocation)
-  Filled area for seabird nesting
-  Enlarged levee for seabird nesting at selected locations
-  Roadbed and levee recontouring with substrate enhancement

-  Proposed salt production
-  Intertidal mudflat
-  Cordgrass
-  Salt marsh

Note:

1. Ponds would be graded to optimize cordgrass habitat for the Light-footed Clapper-Rail.
1. Pond elevations could be altered to achieve desired habitat types.
2. Existing nesting bird areas are protected and some enhancements are proposed.
3. Specific locations and sizes of proposed seabird nesting improvements to be determined.
4. A reduction in the existing salt operation would occur.
5. Reconfiguration of salt ponds may be necessary to accommodate a reduced operation.
6. Restoration of the northwest corner of Pond 11, which is owned by the U.S. Navy, would require approval from the Navy prior to implementation.



0.25 0 0.25 Miles

Source: USFWS, Local Agency Partnership 2000 (2 ft imagery)

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would be restored to tidal influence to facilitate the restoration of approximately 440 acres of intertidal wetlands. Tidal influence would be restored by breaching the outer levees of the ponds. The remaining levees around these ponds would be maintained to provide roosting and nesting habitat for shorebirds, seabirds, and other waterbirds.

Existing nesting habitat for seabirds would continue to be protected and enhanced, as described in Alternative B. Brine invertebrates would continue to be present, but in a significantly reduced solar salt production area. The number of pelican roosting platforms provided within the salt ponds may be limited under this option. Alternative A envisioned three platforms within the ponds if monitoring indicated a favorable response to the platforms by the pelicans. Restoration of the primary ponds would reduce the area available for platform installation. If adequate area is not available within the ponds, one or more of the platforms could be installed in the open bay portion of Refuge. Additional monitoring would be required for any platforms installed in the bay to determine the extent, if any, of human disturbance on roosting pelicans.

Option 1 focused on increasing cordgrass-dominated salt marsh habitat to support the light-footed clapper rail, while this restoration option would provide additional types of wetland habitat including shallow subtidal, intertidal mudflat, cordgrass-dominated salt marsh, and pickleweed-dominated salt marsh. As in Option 1, an effort would be made to move the existing water in the ponds further into the salt evaporation system prior to breaching to allow harvesting of the salts in the water column. Once the ponds are drained, the outer levees would be breached to create an opening 15 to 30 feet wide. If the ponds cannot be drained prior to breaching, the water within the ponds would be flushed into the bay by tidal action.

Pond breaching would be scheduled to occur between the months of October and February to avoid the breeding season. Breaching could occur as a single project, or could be phased over several months or years. The grading described in Salt Works Restoration Option 1 for the western ponds (Ponds 10A, 10, and 11) would also be implemented under this option. In addition, portions of Ponds 12 and 13 would be filled to raise the bottom of the ponds to an elevation suitable for establishing cordgrass, while the elevations in portions of Ponds 14 and 15 would be raised to support intertidal mudflat habitat. An estimated 468,100 cubic yards of appropriate fill material would be needed (*Ducks Unlimited 2004*) to achieve optimum elevations within the primary ponds under this option. The estimated cut and fill volumes required to achieve the desired pond elevations in Ponds 10A and 10 through 15 are presented Table 2-10. As described under Salt Works Restoration Option 1, the actual elevations in each pond would be refined during the preparation of final grading plans to better balance the amount of cut and fill within the restoration area.

Once the levees are breached, natural recruitment of plant, animals, and other organisms would occur over time as the tides facilitate nutrient exchange and disseminate flora and fauna into the breached ponds.



<b>Table 2-10</b> <b>Estimated<sup>1</sup> Cut and Fill Volumes<sup>2</sup></b> <b>for Obtaining the Elevations Proposed Under Salt Works Restoration Option 2</b>										
Pond #	2.9 feet NAVD8 (intertidal mudflats)			3.4 feet NAVD88 (cordgrass-dominated salt marsh)			3.9 feet NAVD88 (pickleweed-dominated salt marsh)			Pond Net
	Cut	Fill	Net	Cut	Fill	Net	Cut	Fill	Net	
10	(2,600)	100	(2,500)	(77,300)	700	(76,600)	(6,400)	300	(6,100)	(85,200)
10A	-	-	-	(20,800)	-	(20,800)	-	-	-	(20,800)
11	-	-	-	(1,200)	272,500	271,300	(100)	-	(100)	271,200
12	-	-	-	(2,300)	193,900	191,600	(700)	100	(600)	191,000
13	-	-	-	(10,400)	88,400	78,000	-	-	-	78,000
14	(1,800)	6,000	4,200	-	-	-	-	-	-	4,200
15	(1,400)	28,500	27,100	-	200	200	-	2,400	2,400	29,700
Total	(5,800)	34,600	28,800	(112,000)	555,700	443,700	(7,200)	2,800	(4,400)	468,100

<sup>1</sup> Volumes are based on preliminary restoration plans and should not be viewed as specific values.

<sup>2</sup> All volumes are presented in cubic yards.

#### Salt Works Restoration – Construction Methods

Implementation of either of these two restoration options would require the development of detailed restoration and engineering plans and a full description of construction methods. Once these details are available, additional analysis under NEPA would be conducted. Provided below is a summary of the anticipated construction methods. This information may be refined following the completion of detailed construction plans for this area.

Earthwork Methods and Equipment: It is likely that a hydraulic dredge would be used to implement restoration within the salt works, as it is doubtful that the bottoms of the ponds could be recontoured using land-based equipment. Given the magnitude of grading proposed in the various ponds, a 10-inch portable hydraulic dredge would likely be the most appropriate type of equipment to be used to achieve the desired elevations, provided water levels could be maintained during the operation. A portable dredge would be trucked to the project site in modules and assembled onsite to minimize mobilization costs. Assembly of the dredge could occur on the project site or at a nearby harbor where the dredge would then be towed to the salt works.

The use of a hydraulic dredge would greatly reduce the time required to complete the proposed work, and would also reduce the stress on the levees that would otherwise need to be used as haul roads. The primary disadvantage of using hydraulic dredging is that the fill added to the ponds would not be compacted, making it more susceptible to erosion than fills placed using land-based equipment. In addition, the final grade of placed fill would not be as controllable with hydraulic equipment as it would be with land based equipment. Either the elevation and slope tolerances would have to be loosened or the area reworked after the fill has had time to settle and dry out, which could take upwards of a year.

Dredges need a significant water depth in order to operate efficiently, therefore, recontouring would have to be accomplished prior to removing a significant volume of water from the ponds, or the ponds would have to be refilled with bay water prior to dredging. Either way, the ponds would be recontoured prior to breaching. This would allow any sediment plume to be trapped within the pond system. Once the desired

elevations in the ponds are achieved, the pond levees would be breached using an excavator. Material removed from the levee to create a 15- to 30-foot breach would be side cast to the adjacent interior levee slope.

Levee Protection: Within the salt ponds the southern levees currently form the northern edge of the Otay River channel. These levees are subject to overtopping during a significant flood event. Such an event could result in significant damage to the restored intertidal habitat in Ponds 12, 13, 14, and 15. Various slope protection measures can be incorporated into the restoration design to reduce the potential for levee failure during overtopping. Such measures include the use of biotechnical bank stabilization (the use of living plant material to reinforce soil and stabilize slopes), stone revetment, geotextile-reinforced soil, and concrete armor unit revetment. To provide a conservative assessment of the potential impacts that could result from the installation of levee protection measures, the project description assumes that the entire length of the levee along Ponds 20, 22, and 48 would be protected with a stone revetment from the top of the levee to an appropriate depth below the channel bottom. This revetment would be covered with geotextile-reinforced soil and revegetated with native plants to soften the appearance of this feature.

Following restoration, the levees within the salt works would be retained in their concurrent configuration. The only changes proposed to the levees include the reinforcement described above, the enhancements proposed to improve the habitat quality for nesting seabirds, and the occasional breaches in the levees to facilitate tidal circulation. Some of these breaches may be bridged to maintain access around to outer levees for maintenance, monitoring, law enforcement, and specific public uses. Because of the potential for erosion, particularly to the outer levees, from wind, wind-generated waves, and tidal currents moving in and out of the ponds, the levees would require routine monitoring and occasional maintenance to ensure the long-term stability of the levees.

Construction Access Routes/Staging Areas: As described previously, daily construction traffic would enter and exit the site via Main Street. From that point, all construction traffic would utilize specified levee roads. If fill material were to be imported from the Otay River floodplain, then a temporary bridge could be placed across the drainage channel that extends west from the freeway along the south side of Main Street and/or across the Otay River channel at a point west of the existing bike path.

The primary construction staging area would be located at an existing fenced construction area located between Ponds 20 and 22. The site is already graded and fenced, and is used by the current operator of the salt works.

Construction Phasing: The time required to complete the proposed excavation within the ponds is dependent upon the same factors described for the Otay River floodplain restoration options. Estimates of the time required to excavate the various ponds under Options 1 and 2 assumed the use of a 10-inch hydraulic dredge. Completion of all of the actions proposed for Salt Works Restoration Option 1 is expected to take approximately one to two years, assuming construction would proceed with no stoppages. The completion of required dredging for Salt Works Restoration Option 2 is expected to take 1.5 to three years. The time required for project completion could be greatly reduced if it is determined that a larger dredge can be used. If the restoration is phased, it is likely that construction activity would begin in Pond 11.

### Range of Restoration Scenarios Possible Under this Alternative

Several combinations of restoration scenarios could be implemented under Alternative C as presented in Table 2-11. Some scenarios would result in the need to export or import material to achieve the restoration objectives. Others would result in a balanced grading scheme in which the cut and fill volumes required by each restoration option could be obtained or disposed of on site, eliminating the need to import or export material. The only exception would be the need to import clean sand, which would be required under any of the scenarios presented.

### **Public Use Program**

Under this alternative, existing public uses would be expanded.

### **Public Access**

Public access onto this Refuge Unit would continue to be permitted within the open waters of the bay. The number of guided nature tours conducted around the salt ponds would increase. This alternative also proposes to open the northern levee of Pond 11 to public access during daylight hours for the purpose of accommodating wildlife observation and fishing. Also proposed is the construction of a 0.4-mile pedestrian path along the southern edge of the Refuge from 7<sup>th</sup> Street to about 10<sup>th</sup> Street in Imperial Beach. This pedestrian path, which is described in greater detail below, would accommodate wildlife observation activities in the vicinity of the restored western ponds. The pedestrian pathway could also be incorporated into habitat restoration plans for the area to the north of the Bayshore Bikeway between Florida Street and 13<sup>th</sup> Street.

### **Wildlife-Dependent Recreational Uses**

Fishing: The fishing opportunities currently available on the Refuge would be expanded to include shoreline fishing from the northern levee of Pond 11 (refer to Figure 2-9). Fishing along this levee would occur at specified areas and would be permitted only on the bay side of the levee. This activity would be subject to the fishing regulations established by the California Department of Fish and Game. Improvements to the levee would be required to adequately accommodate a shoreline fishing program. These improvements, which would be developed as part of a step-down public use plan for this area, could include hardening of the levee surface to ensure appropriate accessibility; establishing fishing platforms along the levee to reduce the potential for erosion along the outer levee slope, constructing an informational kiosk; installing fencing and gates to control access and avoid unauthorized access beyond the northeastern end of the levee; and developing other facilities that may be deemed appropriate to accommodate this use.

Wildlife Observation and Photography: Opportunities for wildlife observation and photography are currently provided in Refuge waters via watercraft, during guided nature tours around the salt ponds, and immediately adjacent to the Refuge along the Bayshore Bikeway and from the County's Biological Study Area. These opportunities would be expanded under Alternative C to include an increase in the number of guided nature tours and construction of an observation area at the eastern end of Pond 11's northern levee.

The number of guided nature tours would be increased to approximately two tours per month between mid-September and early February of each year. No tours would be provided during the nesting season to avoid disturbance to nesting birds. Guided tours could be lead by Refuge staff or authorized volunteer organizations, such as the Chula Vista Nature Center and the San Diego Audubon Society. These tours would provide the

**Table 2-11**  
**Various Restoration Scenarios<sup>1</sup> Under Alternative C**  
**with Estimated Net Grading Requirements for Each Scenario**

Estimated Net Grading Volumes (cubic yards)	Otay Option 1	Otay Option 1 + Salt Works Option 1	Otay Option 1 + Salt Works Option 2	Otay Option 2	Otay Option 2 + Salt Works Option 1	Otay Option 2 + Salt Works Option 2	Salt Works Option 1	Salt Works Option 2
Otay Floodplain – Cut	723,000	723,000	723,000	970,000	970,000	970,000	0	0
Otay Floodplain – Fill	565,600	400,400	97,500	460,600	460,600	344,500	0	0
Salt Works – Cut	0	0	0	0	0	0	0	0
Salt Works – Fill	0	165,200	468,100	0	165,200	468,100	165,200	468,100
Nesting Enhancements - Fill	157,400	157,400	157,400	157,400	157,400	157,400	157,400	157,400
Imported Nesting Substrate	116,000	116,000	116,000	116,000	116,000	116,000	116,000	116,000
Fill Material to be Imported	0	0	0	0	0	0	322,600	625,500
Fill Material to be Exported	0	0	0	352,000	186,800	0	0	0
Grading Balanced On Site <sup>2</sup>	Yes	Yes	Yes	No	No	Yes	No	No

<sup>1</sup> Each scenario includes the nesting enhancements described in Alternative B.

<sup>2</sup> Clean, light-colored sand would be imported to the site under any of these scenarios.

Sources: (Ducks Unlimited 2004) and (David Cannon, Everest International Consulting, per. comm. 12/03)

public with a unique opportunity to observe and photograph the thousands of migratory and wintering birds that visit the Refuge. A reservation system would be established in association with the expansion of this program, as each tour would be limited to a maximum of 15 people.

The northern levee of Pond 11 would be opened to public access for wildlife observation and photography, in addition to shoreline fishing. The step-down public use plan discussed under Fishing would also address the design, specific location, and construction of an observation platform at the northeast end of the levee. This platform would provide opportunities for observing and photographing birds on the mudflats and adjacent river channel. Other improvements would include making the levee accessible per the draft accessibility guidelines for outdoor recreation areas proposed by U.S. Access Board and providing effective fencing to prevent public access beyond the eastern end of the levee.

To improve opportunities for wildlife observation, this alternative also includes a proposal to construct a pedestrian path along much of the southern edge of the salt works, from 7<sup>th</sup> Street to 10<sup>th</sup> Street and possibly from Florida Street to 13<sup>th</sup> Street. This pathway would be six to eight feet wide and would be constructed to the north of and parallel to the Bayshore Bikeway.

The construction of the pedestrian path would provide a number of benefits for Refuge visitors, including a safer opportunity for observing wildlife within the refuge. Currently, wildlife observers and bicyclists are sharing the same ten-foot pathway, which represents a safety issue for all users. In addition to providing a separate pathway for pedestrians, this facility would also be designed to route pedestrians away from sensitive habitat areas. Currently, to avoid conflicts with bicyclists, pedestrians often chose to walk to the north of the bike path along the edge of the salt ponds. This off-trail activity disturbs wildlife and has resulted in the loss of vegetation adjacent to the ponds. Once the ponds are restored to salt marsh habitat, the impacts of this off-trail activity would likely increase unless an alternative access route is provided (i.e., the proposed pedestrian path).

Environmental Education: Under this alternative, funding would be sought to extend the Habitat Heroes program described under Alternative A. To establish this program as a permanent part of the Refuge's environmental education program would require a long-term funding source. As part of this program, habitat restoration currently being implemented on the Refuge along the Bayshore Bikeway would be expanded to include additional areas of upland located between the Bayshore Bikeway and the Otay River channel.

This alternative also includes a proposal to partner with other agencies and non-governmental organizations to create and identify funding for an interagency environmental education coordinator for the South Bay. The establishment of such a position within the South Bay would ensure coordination among the various environmental education programs in the area.

Environmental Interpretation: Under this alternative, the Service would partner with other agencies to develop a coordinated interpretive program for San Diego Bay. Such a program would involve collaboration among all of the agencies surrounding the Bay including the Cities of Coronado, Imperial Beach, National City, Chula Vista, and San Diego, the County of San Diego, the U.S. Navy and the Port. Refuge staff would work with

these agencies to ensure that some signage is devoted to interpreting bay habitats and Refuge resources.

### **Other Public Uses**

Otay Valley Regional Trail: The eastern end of the South San Diego Bay Unit (specifically, the Otay River floodplain) is included within the approved planning boundary of the Otay Valley Regional Park (OVRP). The planning boundary, which was approved prior to establishing the South San Diego Bay Unit, encompasses more than 8,000 acres, and extends about 13 miles inland from the southeastern edge of the salt ponds at the mouth of the Otay River to the land surrounding both Lower and Upper Otay Lakes. The OVRP is a multi-jurisdictional planning effort by the County of San Diego and the cities of San Diego and Chula Vista. A Concept Plan for the OVRP was approved by the participating agencies in May 2001 (*County of San Diego 2001*).

One of the components of the OVRP, as described in the Concept Plan, is a proposal to create a regional trail through the Otay River Valley. The trail would extend east/west from the eastern planning boundary, where the trail would travel through portions of the San Diego NWR, to the Bayshore Bikeway located to the west of I-5. To facilitate the completion of this regional trail, this alternative includes a proposed alignment for the trail through the eastern end of the South San Diego Bay Unit (see Figure 2-9). the alignment proposed under this alternative would extend west from the I-5 bridge, north of the river channel, then travel northwest along the eastern border of the South San Diego Bay Unit for approximately 2,000 feet (refer to Figure 2-9). When constructed, the trail would connect to the proposed Bayshore Bikeway near the northeastern corner of the Refuge.

The City and County of San Diego are currently studying a variety of potential alignments for the Otay Valley Regional Trail that differ from the alignment shown on Figure 2-9. However, the alignment illustrated in Figure 2-9 continues to be included here in the event the other alignments prove not to be feasible. One alignment under consideration would take the trail under the I-5 bridge then turn south using land owned by the City of San Diego. Another alignment being studied would use the existing “paper streets” (undeveloped streets created through a subdivision map that are owned in fee title by the City of San Diego and located outside of the Refuge boundary) that extend from the I-5 bridge westward almost to the existing bicycle path in undeveloped Saturn Boulevard. A small area of Refuge land would have to be crossed to make the connection to the existing bike path.

At this writing, the exact alignment of the trail is still being worked out with the various agencies involved in implementing the OVRP. To facilitate impact analysis and completion of a Compatibility Determination, the alignment shown in Figure 2-9 is the alignment included as part of Alternative C. If a different alignment is selected that incorporates Refuge land, additional analysis and review in accordance with the Service’s Compatibility Policy may be required.

If it is ultimately determined that some or all of the trail would be located on Refuge land, the local agencies participating in the development of the OVRP would be responsible for obtaining approval from the Refuge Manager prior to constructing, funding, and installing the trail in accordance with the stipulations described in the Compatibility Determination for a Regional Trail (Appendix K). The OVRP would also be responsible for maintaining the trail and associated amenities such as fencing and signage; monitoring trail use; and patrolling the trail to ensure compliance with established trail regulations. If constructed,

the trail would provide additional opportunities for wildlife observation and environmental interpretation on the Refuge.

### **Other Uses**

**Solar Salt Production:** This alternative assumes that solar salt production would continue within a reduced footprint under either of the restoration options presented for the salt works. Modifications to the current pond configuration within the eastern portion of the salt works would most likely be required to facilitate efficient salt production within the reduced footprint. The existing tide gate would also be relocated from Pond 10 to one of the remaining ponds located to the east of the river channel. A revised Refuge Special Use Permit for salt production would include conditions to ensure the protection of the restored wetland areas, as well as conditions related to the protection of endangered and threatened species and other trust resources supported within the Refuge.

### **Environmental Contaminants**

Prior to initiating any restoration actions, the contaminant investigations and/or baseline sampling recommendations included in the CAP would be completed and proposed remediation actions would be implemented prior to or in association with restoration.

### **Cultural Resource Management**

The salt works, including the levees, ponds, stacks of salt near the processing plant, and the interrelationship of all of the phases of solar salt pond production have been determined to be historic properties. Therefore, prior to restoring the ponds an analysis would be completed in accordance with NHPA to determine the potential effects of pond restoration on the use, design, and function of the salt works. Under Salt Works Restoration Option 2, a treatment plan would also be prepared and implemented for mitigating adverse effects to historic resources caused by the proposed restoration activities.

Cultural resource surveys conducted within the Otay River floodplain have identified archaeological sites and others may be present. One site that has already been recorded will need to be evaluated for eligibility to the NRHP. The eligibility determinations, assessment of project effects, and treatment plans would involve consultation with SHPO and other interested parties.

In completing these actions, the Service would work with federally recognized Tribes, historical societies and museums, the SHPO, and other interested parties. Native American Tribes, Groups, and direct lineal descendants that may be affiliated with the Refuge lands would be identified and a Memorandum of Understanding with the appropriate Native American groups would be created to establish procedures for implementing the inadvertent discovery clause of NAGPRA.

### **Step-Down Management Plans**

#### **Fire Management Plan**

Implementation of either of the restoration options for the Otay River floodplain would restore weedy upland vegetation to native habitat, which would reduce the need for some of the fire suppression activities described in the fire management plan. All other aspects of the fire management plan, as described in Alternative A, would be unaffected by the proposals included in this alternative.



### **Predator Management Plan**

The predator management activities described in Alternative A for the Sweetwater Marsh Unit would also be implemented under this alternative. In addition, to avoid increases in predation following restoration, several additional measures would be implemented under this alternative. These include installing additional fencing, where appropriate, on the salt pond levees to reduce access into the area by mammalian predators and constructing artificial nesting platforms in restored marsh areas to provide cover for roosting and nesting clapper rails.

### **2.3.2.4 Alternative D – Preferred Alternative: Expand Habitat Management, Enhance Nesting Opportunities, Maximize Habitat Restoration, and Provide Additional Public Use Opportunities**

Alternative D (Figure 2-14) proposes to enhance opportunities for seabird nesting, restore native habitat in the Otay River floodplain, improve habitat quality for listed species, and restore tidal circulation within the majority of the salt ponds in the South Bay. Those ponds that are not breached would be maintained in their current configuration and the water in the ponds would be managed to support a variety of migratory birds and wintering waterfowl. The rationale for this alternative, which maximizes opportunities for habitat restoration, reflects the need to restore sensitive coastal habitats within San Diego Bay, while also maintaining those aspects of the existing salt pond system that support nesting seabirds and other migratory birds. The salt ponds and associated levees currently provide foraging, roosting, loafing, and nesting habitat for a variety of avian species; however, habitat for most other wetland or aquatic species is limited, particularly for fish and benthic invertebrates. Implementation of this alternative would increase the habitat value in the South Bay for a wide variety of organisms. Further, the proposal to restore significant areas of cordgrass within the South Bay would implement one of the recovery actions of the Light-footed Clapper Rail Recovery Plan (USFWS 1985). With respect to public use, this alternative proposes to expand the current public use program by providing new opportunities for wildlife observation and environmental interpretation around the perimeter of the Refuge Unit.

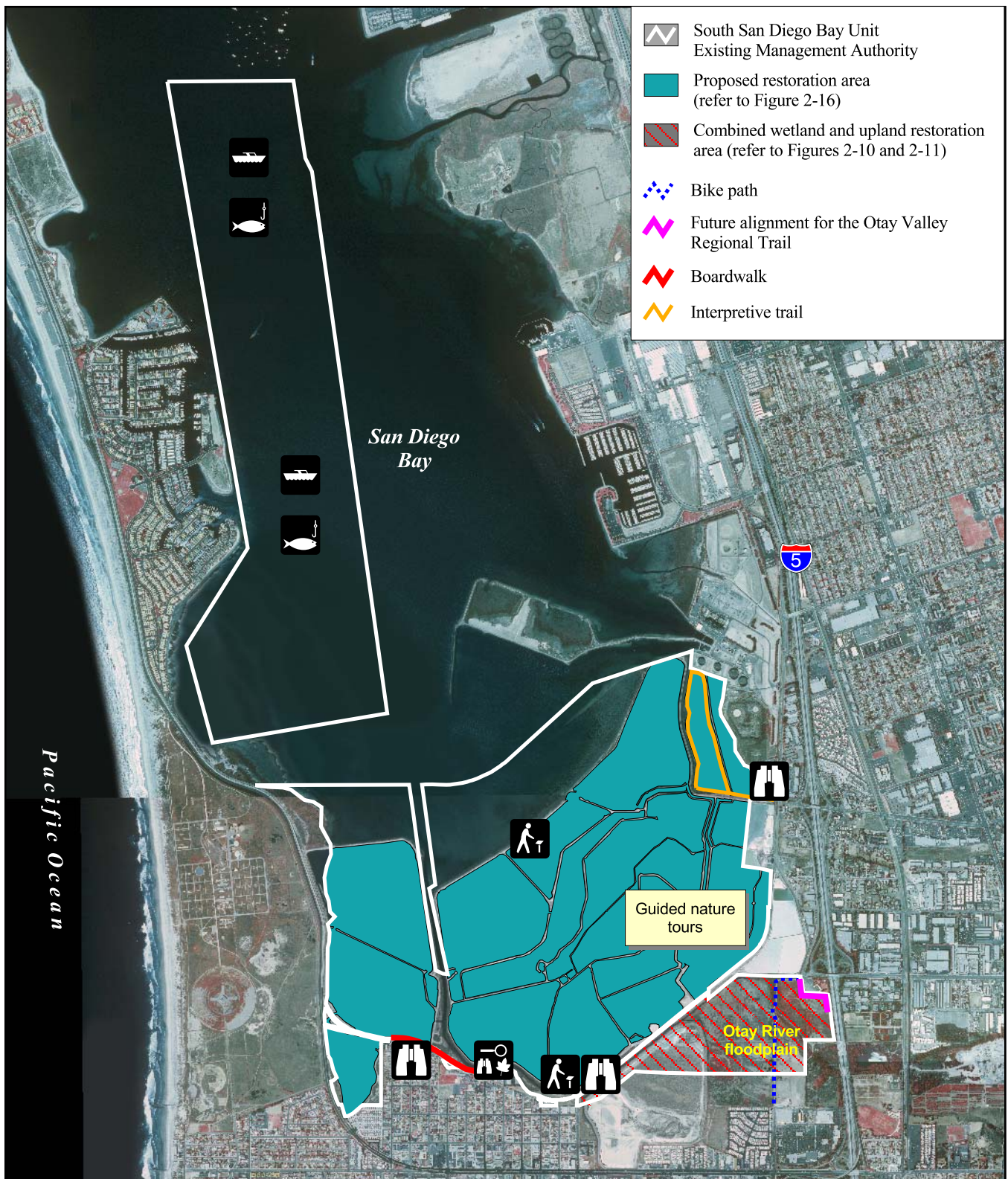
Before this alternative could be implemented, it would be necessary to: identify funding to facilitate step-down planning for the restoration and public use proposals included under this alternative (e.g., final restoration/engineering plans for the salt ponds and Otay River floodplain); prepare environmental documentation necessary to address any issues raised during step-down planning; obtain required permits and approvals; and secure funding for implementation.

### **Wildlife and Habitat Management**

While the primary focus of this alternative is the restoration of the majority of the salt ponds to tidal influence, it also includes other important aspects of Refuge management, such as maintaining the levees for seabird nesting and managing water and salinity levels in some ponds to provide habitat and foraging opportunities for migratory birds. Monitoring would also be an important aspect of refuge operations following restoration.

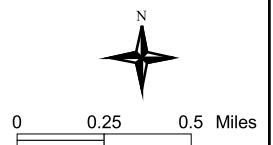
### **Habitat Restoration**

Pond Restoration: Under this alternative, Ponds 10A, 10 through 15, 23, 24, 25, 28, 29 and 30 would be restored to tidal influence, facilitating the restoration of approximately 650 acres of intertidal wetlands (Figure 2-15). Several implementation scenarios are addressed, including restoring the entire salt pond complex in a single action and implementing restoration through a phased approach. To restore tidal action to the individual ponds, one or more breaches would be made in the outer pond levee.



**Figure 2-14**  
**South San Diego Bay Unit, Alternative D**

boating
 fishing
 observation area
 environmental education
 interpretive element/program



Source: Local Agency Partnership (2 ft imagery, year 2000)

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The portions of the levees that are not affected by breaching would be maintained to protect seabird nesting areas. Those ponds that are not restored to tidal influence would be managed to regulate water and salinity levels to support migratory birds, particularly shorebirds and waterfowl.

The types of habitats and potential acreages that could be restored within the salt ponds under this alternative are presented in Table 2-12. These habitat acreages are provided to facilitate environmental analysis of future pond restoration. The actual mix of habitat types and total acreage of each would be determined during subsequent detailed restoration planning. This alternative also includes the habitat restoration proposals for the Otay River floodplain, which are described in Alternative C. Potential habitat acreages for restoration within this portion of the Refuge Unit are provided in Table 2-7.

Table 2-12 Habitat Acreages Within a Restored Salt Works (Alternative D)								
Habitat Types (Acres) <sup>1</sup>								
Shallow subtidal	Intertidal mudflat	Cordgrass-dominated salt marsh	Pickleweed-dominated salt marsh	<u>Levees around restored ponds</u>	Managed water area <sup>2</sup>	Brine production area <sup>2</sup>	New nesting habitat	Active salt ponds
44	124	447	32	<u>86</u>	<u>240</u>	<u>50</u>	36	0

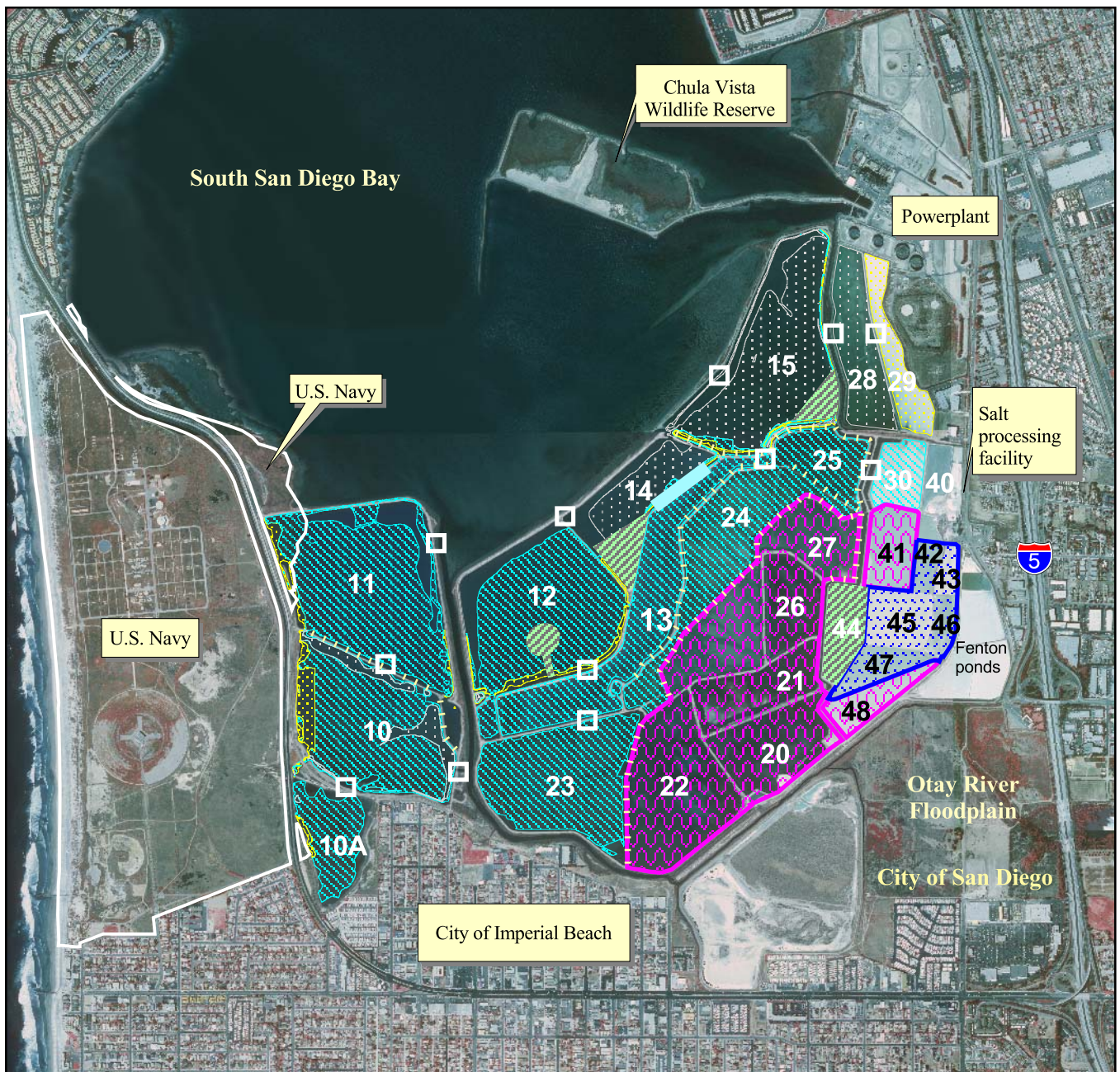
<sup>1</sup> These acreage figures are subject to change during detailed restoration planning and are provided here to facilitate the analysis of potential impacts as a result of manipulating existing pond elevations and restoring tidal influence to various salt ponds.

<sup>2</sup> Acreages include the adjacent levees.

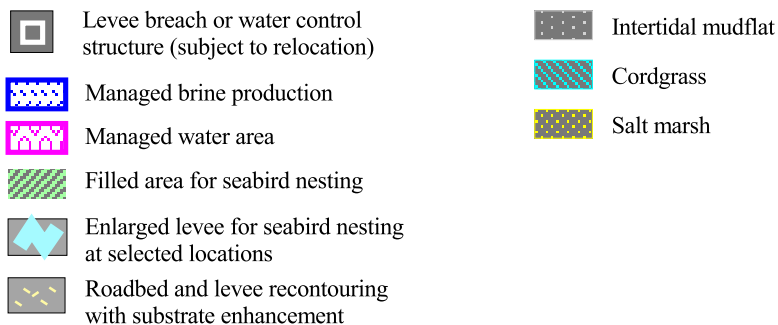
To achieve the desired habitat types presented in Table 2-12, modifications to the current pond system would be required, including grading (cutting or filling) to adjust the elevations within the ponds, breaching the pond levees, and potentially reconfiguring some of the ponds proposed for water or brine management. Such modifications include:

- Recontouring the bottom elevations of Ponds 10A and 10 through 13 as described in Alternative C, Salt Works Restoration Option 2;
- Retaining the existing elevations in Ponds 14 and 15 to support intertidal mudflat habitat;
- Lowering the elevations in portions of Ponds 23, 24, and 30 to support cordgrass-dominated habitat;
- Recontouring Pond 25 through a combination of lowering higher areas and filling lower areas to achieve elevations suitable for the establishment of cordgrass and other desired intertidal habitats;
- Removing gypsum and crystallized salt from Pond 28 and if necessary lower the pond elevations to support intertidal mudflat habitat;



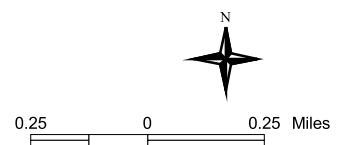


**Figure 2-15**  
**South San Diego Bay Unit, Alternative D**  
**Salt Works Restoration Proposal**



Note:

1. Intensive water management for water birds is proposed.
2. Ponds would be graded to optimize cordgrass habitat for the Light-footed-Clapper-Rail.
2. Pond elevations could be altered to achieve desired habitat types.
3. Specific locations and sizes of proposed seabird nesting improvements to be determined.
4. No salt production.
5. Pond 20 managed for western snowy plover nesting.
6. Restoration of the northwest corner of Pond 11, which is owned by the U.S. Navy, would require approval from the Navy prior to implementation.



Source: USFWS, Local Agency Partnership 2000 (2 ft imagery)

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- Removing gypsum and crystallized salt from Pond 29 and if necessary lower the pond elevations to support pickleweed-dominated salt marsh habitat;
- Breaching the levees of the ponds proposed for restoration to facilitate tidal exchange;
- Retaining the general configuration of the levees around the various ponds to support seabird nesting;
- Installing new hydraulic structures to facilitate the movement of bay water through Ponds 20, 21, 22, 26, 27, 41, and 48 to allow seasonal control of water levels;
- Installing new hydraulic structures to convey water through Ponds 42, 43, 45, 46 and 47 for the purpose of achieving a salinity range that would support brine invertebrates;
- Modifying the channel that flows between Ponds 27 and 41 to provide a connection into the existing Palomar drainage channel, which extends between Ponds 15 and 28; and
- Filling Pond 44 and portions of other ponds to create a minimum of 36 acres of new opportunities for seabird and shorebird nesting.

Substrate analyses of the existing sediments within the ponds, as well as any material to be imported from the Otay River floodplain, would be completed to determine the suitability of the sediments for salt marsh restoration before any excavation occurs within the ponds. This analysis would consider such factors as grain size, salinity levels, organic content, and available nutrients. Analyses of contaminant levels, if any, within these substrates would also be conducted. After grading and dredging have been completed and the desired pond elevations and sediment composition are achieved, the levees would be breached to facilitate the natural recruitment of plants and animals. Some plant species, such as cordgrass, may be reintroduced into particular ponds to accelerate plant establishment. This process would occur after the soils within the ponds are properly consolidated and would involve transplanting plugs of cordgrass from nearby sources to the designated ponds. Once established, these specimens would be expected to spread into other areas of the ponds where appropriate elevations and tidal influence exist to support cordgrass habitat.

To facilitate impact analysis at the program-level, an analysis of potential grading requirements was conducted based on the preliminary restoration design illustrated in Figure 2-15. The optimum elevations for achieving each habitat type were used to estimate the grading requirements in each pond to be restored. As a result of this preliminary engineering, it was determined that the grading required to achieve the optimum elevations within the ponds would generate an estimated 165,700 cubic yards of excess material (Ducks Unlimited 2004). This dirt would have to be exported from the Refuge to an appropriate disposal site. The estimated cut and fill volumes associated with achieving the desired elevations in each of the affected ponds is presented in Table 2-13. As described under Alternative C, there are opportunities for achieving a better grading balance throughout the restored pond system by excavating or filling to the upper or lower range of a habitat type. More precise cut and fill estimates would be developed in association with detailed restoration planning.

The grading estimates provided in Table 2-13 do not take into consideration the type of material present in the ponds. Specifically, Ponds 25, 28, and 29 may include a gypsum crust or irregular gypsum formations. This material may not be considered acceptable fill for placement in other ponds. Material that is not acceptable for disposal in other locations within the Refuge would have to be exported offsite to an approved disposal site. Additional information regarding the soils and other materials present in the ponds would be obtained in association with the development of final restoration plans.

<b>Table 2-13</b> <b>Estimated Cut and Fill Volumes (cubic yards)</b> <b>for Obtaining the Proposed Pond Elevations Under Alternative D</b>										
Pond #	2.9 feet NAVD88 (intertidal mudflats)			3.4 feet NAVD88 (cordgrass-dominated salt marsh)			3.9 feet NAVD88 (pickleweed-dominated salt marsh)			Pond Net
	Cut	Fill	Net	Cut	Fill	Net	Cut	Fill	Net	
10	(2,600)	100	(2,500)	(77,300)	700	(76,600)	(6,400)	300	(6,100)	(85,200)
10A	-	-	-	(20,800)	-	(20,800)	-	-	-	(20,800)
11	-	-	-	(1,200)	272,500	271,300	(100)	-	(100)	271,200
12	-	-	-	(2,300)	193,900	191,600	(700)	100	(600)	191,000
13	-	-	-	(10,400)	88,400	78,000	-	-	-	78,000
14	(1,800)	6,000	4,200	-	-	-	-	-	-	4,200
15	(1,400)	28,500	27,100	-	200	200	-	2,400	2,400	29,700
23	-	-	-	(149,400)	1,300	(148,100)	-	-	-	(148,100)
24	-	-	-	(192,900)	100	(192,800)	-	-	-	(192,800)
25	-	-	-	(15,600)	8,000	(7,600)	-	-	-	(7,600)
28	(71,100)	-	(71,100)	-	-	-	-	-	-	(71,100)
29	-	-	-	-	-	-	(104,700)	-	(104,700)	(104,700)
30	-	-	-	(109,500)	-	(109,500)	-	-	-	(109,500)
Total	(76,900)	34,600	(42,300)	(579,400)	565,100	(14,300)	(111,900)	2,800	(109,100)	(165,700)

Source: Ducks Unlimited 2004

**Managed Water Area:** The existing water conveyance system within the salt works would be modified to facilitate the flow of bay water through Ponds 20, 21, 22, 26, 27, 40, and 48. Through a combination of gravity movement and pumps, water from the bay would flow into the system via a pipe or channel extended through Pond 23 and emptying into Pond 22. Screening would be installed at the intake system to restrict the introduction of fish into the managed ponds. The water in the ponds would be managed to ensure that salinity levels in the ponds would remain consistent with salinity levels in the bay. In addition, the water levels in the ponds would be regulated throughout the year to support the foraging and loafing activities of migratory birds. In some ponds, water levels may be lowered during the nesting season to provide suitable nesting habitat for western snowy plovers.

The salinity levels within these ponds would be maintained at no greater than 40 ppt. Discharge from these ponds could either be moved into the brine management area (described below) or diluted back to a salinity level acceptable for discharge into the bay. The manner in which the discharge is handled would depend upon the needs of the water management system at the time of proposed discharge.

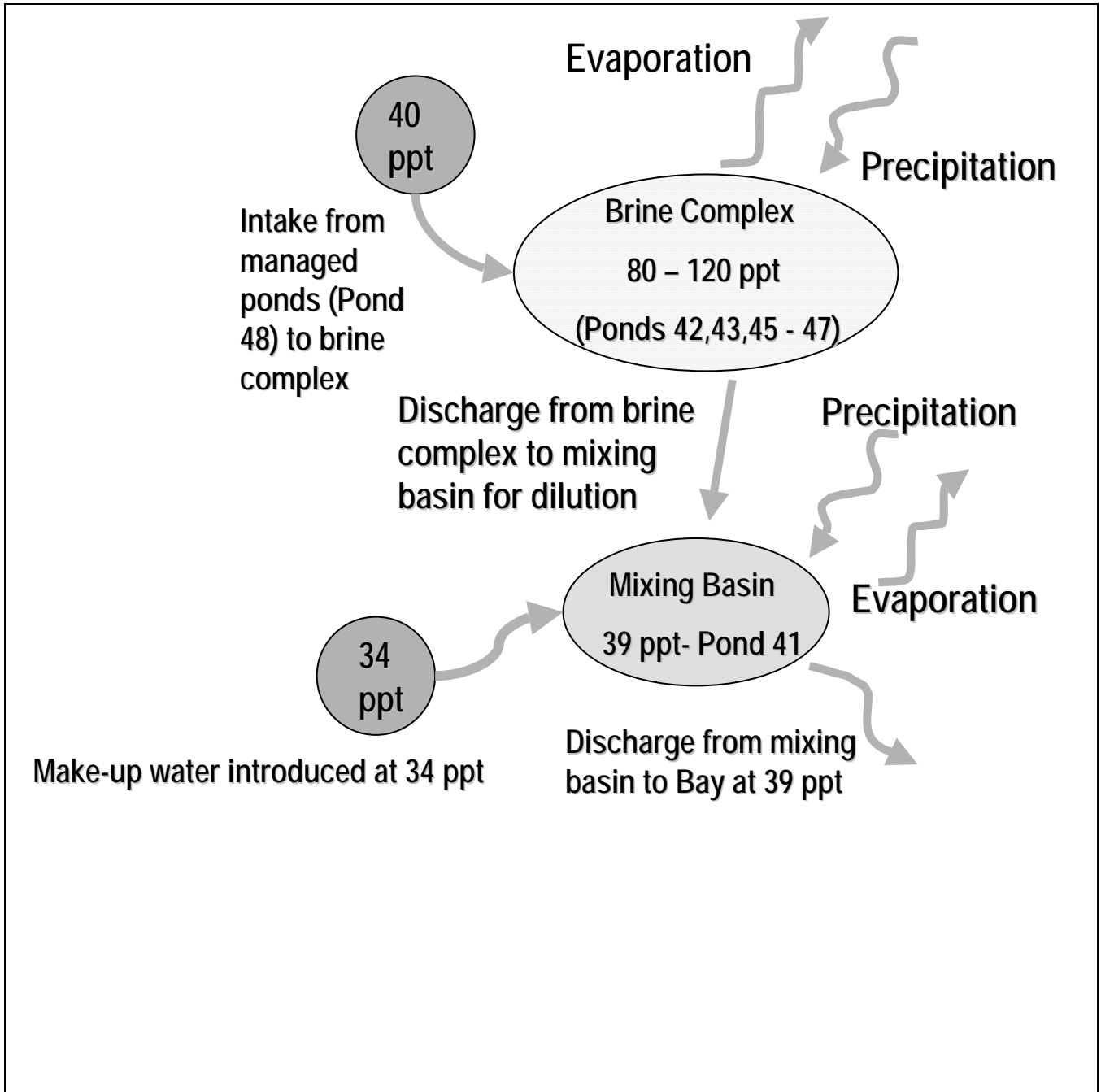
**Brine Production Area:** Ponds 42, 43, 45, 46 and 47 would be managed to maintain salinity levels in the range of 60 to 120 ppt for the purpose of continuing to provide a source of



brine invertebrates, particularly brine flies (*Ephydra sp.*) and brine shrimp, for those birds that currently utilize this resource at the salt works. To achieve this hypersaline environment, inflow to the brine ponds would be supplied from the managed water area. The salinity of the inflow water is expected to be about 39 ppt. Once the water is moved into the brine ponds, the salinity levels would be permitted to increase through evaporation until a salinity range appropriate for supporting brine invertebrates is achieved. The proposed brine management system was modeled to assess the feasibility of maintaining desired salinity ranges within the system and the feasibility of adequately reducing the salinity level in discharge water to levels appropriate for discharge into the bay (*Philip Williams & Associates and DHI Water & Environment[PWA and DHI] 2003*). The results of this modeling indicate that the desired salinity range could be maintained through modest pumping rates. The model assumes that as water is pumped into the brine management system, the higher salinity brine water would be pumped out, with pumping rates expected to vary from approximately 60 gallons per minute (gpm) in the winter to 170 gpm in the summer. The highest salinities within these ponds (approximately 120 ppt) would occur in the late fall. During the late winter and early spring, salinities are expected to drop to about 80 ppt.

Moving water through the system would necessitate discharging the excess water back into the bay; therefore, the salinities in the discharged water would have to be reduced to an acceptable level of no greater than 39 ppt. Two methods for achieving acceptable salinity levels in water discharged from the system were analyzed (*PWA and DHI 2003*). The first method would involve using one of the ponds as a mixing basin to dilute the hypersaline water to 39 ppt prior to discharge, while the other method would involve flash mixing. Under the first method, the hypersaline water would be discharged into a mixing basin (most likely Pond 41) where bay water or water from the tidal ponds with salinity levels of 34 ppt or lower would be added to achieve a discharge salinity of 39 ppt (Figure 2-16). Once the desired salinity is achieved, water from this mixing basin would be discharged into the existing water flow channel located between Ponds 27 and 41. This channel would be modified to allow the water to flow from the channel into the existing drainage that extends between Ponds 15 and 28. Modeling indicates that the flow rate into the mixing basin would peak at about 1,330 gpm. Approximately 900 gpm would be needed to dilute the brine effluent to discharge levels and the remaining 430 gpm would be required to offset the effects of evaporation within the mixing basin. These pumping rates could be reduced by diluting the brine discharges with flash mixing, in which brine outflow is rapidly diluted in a small basin or channel prior to discharge into the bay. Flash mixing requires smaller flow rates since the effects of evaporation on a small pond surface area are negligible. The channel located between Ponds 27 and 41 provides a possible location for flash mixing (*PWA and DHI 2003*). Additional modeling and analysis would be completed as part of final engineering and restoration design to determine which method would be the most appropriate for this situation.

Water Management Plan: The managed water system would provide benefits for benthic organisms provided pond salinities are maintained at or near bay salinities. The brine management ponds would lack most macro algae and salt marsh vegetation, but would sustain hypersaline phytoplankton and brine tolerant invertebrates. As part of final restoration planning, a water management plan would be prepared to establish the operating, maintenance, and monitoring activities and associated costs required to maintain these managed water systems. This step-down planning process would also provide the opportunity to re-evaluate and/or refine water management options.



**Figure 2-16**  
**Conceptual Layout of the Brine Management Ponds**  
**and Discharge System under Alternative D**

Source: Philip Williams & Associates and DHI Water & Environment 2003

Operation and maintenance activities to be addressed in the water management plan include levee maintenance, water management, equipment and structure repair and replacement, and compliance with discharge requirements. The water management plan would include an initial intensive monitoring program to: 1) establish predicted salinity changes in the ponds under varying seasonal and climatic conditions; 2) verify the predictions of previous modeling regarding the optimal amount and rate of water exchange between the bay and the water management ponds to maintain appropriate salinity levels in the ponds and at the discharge point; and 3) identify any unexpected issues related to water management, such as bacterial growth and prolonged residence times. The data obtained during the initial establishment of the managed water areas would provide information necessary to confirm that the system can be operated as proposed or that changes through adaptive management would be necessary to achieve desired habitat objectives. Long term monitoring of the operating system and habitat values would also be implemented to enable Refuge staff to identify any changes in the system over time.

**Nesting Areas:** The actions described in Alternative B for increasing nesting opportunities for seabirds and other nesting birds would also be implemented under this alternative. In addition, Pond 44 would be filled to create a nesting area surrounded by the managed water and brine production areas. A minimum of 36 acres of nesting habitat would be provided under this alternative. An undetermined amount of additional nesting acreage would be provided through levee widening, as described in Alternative B. The volume of fill required to construct the 36 acres of nesting habitat and the estimated volume of sand required for capping these areas are presented in Table 2-14.

Table 2-14 Estimated Volume of Fill Material Required to Create the Nesting Areas Shown in Figure 2-15							
Location of New Nesting Area	Pond Elevation	Fill Elevation	Fill Area (Acres)	6-Inch Substrate Cap		3-Foot Substrate Cap	
				Base Fill Volume (cubic yards)	Substrate Volume (cubic yards)	Base Fill Volume (cubic yards)	Substrate Volume (cubic yards)
Pond 12	1.5	8.5	5.5	52,800	4,400	31,900	25,300
Pond 14	1.3	8.5	8.9	86,800	7,200	52,200	41,700
Pond 15	1.5	8.5	7.9	74,000	6,400	43,800	36,600
Pond 44	8.3	10.2	14.1	15,900	11,400	-	27,200 <sup>1</sup>
<b>Total</b>	- -	- -	36.4	229,500	29,400	127,900	130,800

<sup>1</sup>Approximately one foot of capping is proposed for the nest site at Pond 44.

Source: Ducks Unlimited 2004

Additional areas of intertidal wetlands, freshwater marsh, and upland habitats would be provided within the Otay River floodplain, as described in Alternative C. The specific acreages to be provided would depend upon which Restoration Option is selected for implementation (refer to Table 2-7 for more detail).

#### Construction Methods

The description of earthwork methods, construction equipment required, construction access routes, and locations of staging areas would be the same as those described in Alternative C for the restoration of the salt works and the Otay River floodplain and those

described in Alternative B for nesting habitat enhancements. Land alteration required to create the managed water and brine production areas would be minimal.

Levee Maintenance and Protection: As described for Alternative C, levee protection measures would be provided for the southern levees of Ponds 20, 22, and 48 to minimize the potential for levee failure during a significant flood event. To provide a conservative assessment of the potential impacts that could result from the installation of levee protection measures, the project description includes the assumption that the length of the levee along these ponds would be protected with a stone revetment. This revetment, which would extend from the top of the levee to an appropriate depth below the channel bottom, would be covered with geotextile-reinforced soil and revegetated with native plants to soften the appearance of this feature.

Also as described in Alternative C, the levees within the salt pond complex would be retained in their concurrent configuration. The only changes proposed include the reinforcement described above, the enhancements proposed to improve the habitat quality for nesting seabirds, and the occasional breaches in the levees to facilitate tidal circulation. Some of these breaches may be bridged to maintain access to outer levees for maintenance, monitoring, law enforcement, and specific public uses. Because of the potential for erosion, particularly to the outer levees, from wind, wind-generated waves, and tidal currents moving in and out of the ponds, the levees would require routine monitoring and occasional maintenance to ensure the long-term stability of the levees.

Construction Phasing: Various scenarios for implementing restoration within the salt pond complex are presented below. This section describes the construction phasing and grading and engineering activities that would be required to implement the various scenarios. A more comprehensive discussion of how restoration of the salt ponds could be phased under the preferred alternative is provided in Appendix D (CCP Implementation). None of these scenarios could be implemented until a final restoration design is completed, appropriate environmental documentation is prepared, and required permits are obtained.

Implementation of the proposed salt pond restoration could occur under several scenarios. The first involves construction that is implemented in accordance with the physical and biological constraints of the site. This scenario assumes that funding is available for the entire project at the time restoration is initiated. Restoration under this scenario would take from six months to 22 months to complete, depending upon the size of hydraulic equipment used to restore the ponds. Under the second scenario, restoration actions would be implemented in several phases or increments and would also facilitate the phased closure of the existing commercial solar salt operation.

A third scenario could be implemented if the Service were to be faced with the unanticipated shut down of the solar salt operation prior to completing final restoration plans. As described in Alternative A, circumstances beyond the control of the Service could result in the closure of the salt works. Under this situation, the Service would have to initiate actions to prevent the buildup of excessive salinity levels in the ponds. Such actions could include moving the water in the ponds in a manner that would permit discharge from the system back into the bay or breaching the pond levees to permit tidal exchange. Scenario 3 addresses the latter action and assumes that in this situation no changes to the existing pond elevations would occur. In the event that the operator of the salt works decides to cease current operations before the Service is ready to implement restoration and another operator cannot be identified to take over solar salt production, the

breach-only option included under this alternative would provide a cost effective solution for managing the ponds in the absence of salt production (refer to Section 2.3.2.1). This option would not however provide the benefits to the light-footed clapper rail that would be realized under scenarios 1 or 2.

Under any of these scenarios, monitoring of the restored areas would be a key element of the overall restoration project. While monitoring under Scenarios 1 or 3 would focus more specifically on data collection and observations made of the overall restoration project, Scenario 2 would include opportunities for implementing monitoring protocols following the completion of individual increments of the overall restoration plan. Additional details regarding these scenarios are presented below. Note that these descriptions are based on preliminary restoration planning, therefore, the specifics of how each scenario would be implemented is subject to change following the completion of detailed restoration plans for the salt pond complex.

Construction Phasing Scenario 1 - Under this scenario, new nesting areas, as described under Alternative B, would be constructed within the appropriate ponds prior to the nesting season. Once completed, the tide gate in Pond 10 that allows bay water to flow into the salt pond system would be closed and Ponds 10A, 10 and 11 would be drained further into the system, as described in Salt Works Restoration Option 1 in Section 2.3.2.3. The water in the western ponds could be transferred into Pond 12 using the existing siphon or a temporary pump. The elevations in the ponds would then be adjusted (through cutting or filling) as described in Salt Works Restoration Option 1. Once the sediments within the ponds have settled, the outer levees of Ponds 10 and 11 would be breached to allow for tidal exchange. The internal levees within Ponds 10A and 10 would also be breached to improve tidal circulation within the breached ponds.

If it is not possible to drain these ponds further into the salt production system, the pond elevations would likely be recontoured while the ponds still contain water. This would require the use of hydraulic equipment. To remove fine sediments from the tail water discharge, a weir or series of weirs would be installed to allow excess water to be discharged to the bay, while containing the sediments within the pond. Once the sediments have adequately settled, the levees would be breached to facilitate tidal exchange.

While grading is occurring in the western ponds, the remaining primary ponds, Ponds 12, 13, 14 and 15, would be drained of their high salinity water. Once again, the ponds could be emptied by either passing the brine (water with salinities higher than bay water) further into the system or by releasing the brine into the bay through levee breaching. Following draining, Ponds 12 and 13 would be recontoured to achieve the desired elevations. No changes in elevation are proposed in Ponds 14 and 15.

The brine in Ponds 23, 24, 25, 28, 29 and 30 would be moved further into the system or discharged into the bay while grading is being completed in the remaining primary ponds. Once drained, grading or dredging to achieve the desired pond elevations would be implemented. At this point, the salt works would be preparing for its final salt harvest and the remainder of the ponds would be emptied as the brine is moved into the crystallizer ponds. During this time, it would be necessary to establish an interim brine invertebrate production area, possibly in Pond 20 or a portion of Pond 22, to ensure the continued production of brine invertebrates for the migratory birds that currently utilize this resource.

Upon removal of the brine from Ponds 20, 21, 22, 26, 27, 41, and 48, this system of ponds would be isolated from the rest of the system to create a managed water area. The bay water that would be pumped through these ponds would likely enter the system via a connection through Pond 23. The water would then exit the system from Pond 27 or 41, where it could be discharged back into the bay or pumped into the brine production ponds.

All remaining salt in Ponds 42 through 47 would be harvested and processed for commercial sale or removed to an appropriate disposal site. Salt that is not harvested from Pond 44 would remain in place since this pond would be filled to create nesting habitat. Ponds 42, 43, 45, 46, and 47 would be isolated into a contained system where hypersaline conditions would support brine invertebrate production. Discharge into the bay from this system would be accomplished as described under Brine Production Area, above.

Implementation of Alternative D under this scenario would be expected to take approximately two construction seasons to complete. Physical and biological monitoring of the restored system would be implemented to evaluate performance, verify outcomes, and anticipate management improvements.

Construction Phasing Scenario 2 - Under Scenario 2, restoration of the salt pond complex would occur in phases beginning with the restoration of western ponds followed by the phased restoration of the eastern ponds. Details regarding timing and the various management actions that would be implemented through this phased approach are provided in Appendix D (CCP Implementation). The specific details described in Appendix D are subject to change or refinement during step-down planning. Revisions to the phasing plan may be prompted by new information regarding the site or sensitive resources, changes in funding availability, and/or recommendations made following the completion of detailed site analysis (e.g., hydrological modeling, soils analysis, contaminants sampling, biological monitoring results). The anticipated construction-related activities associated with the implementation of scenario 2 are addressed below.

The first phase of construction would involve the western ponds, with Pond 11 to be restored first, followed by Ponds 10 and 10A. To do this, the outflow of water from the western ponds to Pond 12 would require some modification prior to separating Pond 11 from the rest of the system. As part of this process, the water in Pond 11 would be moved into Pond 12 via the existing gravity flow system. Once the majority of the water is emptied from Pond 11, the pond elevations would be contoured to facilitate habitat restoration in accordance with the final restoration plans. The levee would then be breached and monitoring would begin to evaluate plant and animal species recruitment; observe the efficiency of tidal circulation and sediment and hydrological changes; record avian activity on the adjacent berms; and evaluate general achievement of restoration objectives.

The next phase would involve restoration of Ponds 10 and 10A. Scenario 2 assumes that solar salt production would continue during a phased restoration process; therefore, the eastern ponds would continue to be an active part of a reduced salt works operation until restoration of the eastern ponds is underway. As a result, the existing intake for the salt works, which is currently located in Pond 10, would have to be relocated or modified prior to separating Pond 10 from the system. Several options for redesigning the intake system would be investigated, including constructing a new tide gate in Pond 12 or modifying Pond 10 to allow water to enter the existing tide gate and immediately be directed into the



siphon that currently empties into Pond 12. Prior to removing or closing the siphon, the water in Ponds 10 and 10A would be allowed to flow into Pond 12.

Once the majority of the water is emptied from Ponds 10 and 10A, the pond elevations would be contoured to facilitate habitat restoration in accordance with the final restoration plans and a berm would be constructed around Pond 10A to prohibit tidal waters from entering adjacent properties. The levees would then be breached and monitoring would begin.

Restoration of the eastern ponds would likely begin with the construction of new nesting areas, as described in Alternative B, although this action could occur during the implementation of Phase 1. The restoration approach implemented for the western ponds may be modified for the eastern ponds if monitoring results and observations of restoration success indicate that changes are necessary to achieve restoration objectives. Ponds 12, 13, 14, and 15 would then be drained into the secondary ponds and prepared for restoration. In addition, modifications to the remaining salt ponds and the water intake system would be implemented to facilitate the continued production of salt within the smaller footprint. The intent of this phased approach assumes that solar salt production would continue beyond this phase of restoration. Brine invertebrates would continue to be an ancillary product of salt making.

If the operator determines that commercial solar salt production is not economically feasible beyond this point, no new intake would be required. Under these circumstances, the remaining brine in Ponds 12 through 15 and the secondary ponds could be moved through the system, either by the operator or entity acting on behalf of the Service, to permit the salinity levels to increase to the point at which sodium chloride would precipitate out. This salt could then be harvested and processed for sale or removed and taken to an appropriate disposal site, thus avoiding the need to discharge any brine into the bay.

Once the majority of the water is emptied from the remaining primary ponds, the pond elevations would be contoured to facilitate habitat restoration in accordance with the final restoration plans. After achieving the desired elevations, tidal circulation would be restored to the ponds and monitoring activities would be expanded to include this phase of the restoration.

The duration of time between the completion of phase 2 and implementation of the final restoration phase would depend upon any of several factors, including whether salt production has continued beyond phase 2, funding is available to implement the next phase, and/or the desired restoration objectives are being achieved in the initial restoration phases. If salt production has been abandoned, it would be necessary to implement the final phase of restoration immediately after the completion of this phase. This would be done to avoid the loss of shallow open water environments and the existing brine invertebrate resource that has been provided by the salt works operation. If salt production continues following the completion of this phase, then the implementation of the final restoration phase may occur several years later pending availability of funding for completion of the project.

The implementation of the final phase of the restoration plan would involve the breaching of Ponds 23, 24, 25, 28, 29, and 30, as described in Scenario 1. This activity would coincide with establishing managed water and brine production areas. Pond 44 would be filled to

create a new seabird nesting area. Under this scenario, if commercial salt production continues commercial solar salt production would end as the last of the salts are harvested from the remaining unbreached ponds.

**Construction Phasing Scenario 3** - The ponds proposed for tidal restoration under Scenarios 1 and 2 would also be breached under this scenario; however, the existing elevations within the ponds would not be modified. The habitats that would ultimately become established would be a function of the existing elevations within each pond. Figure 2-17 illustrates the habitat types expected under this scenario. The estimated acreage of each habitat type is provided in Table 2-15.

Table 2-15 Habitat Acreages Expected Within the Salt Ponds Under Construction Phasing Scenario 3					
Habitat Types (in Acres)					
Shallow subtidal	Intertidal mudflat	Cordgrass-dominated salt marsh	Pickleweed-dominated salt marsh	Uplands (areas above MHHW and pond levees)	New nesting habitat
45	370	70	235	300	36

Breaching could occur when the ponds are full or empty. The proposals for creating water management and brine production areas, as well as for implementing nesting enhancements, would also be implemented under this scenario.

#### Range of Restoration Options Possible Under this Alternative

Several combinations of restoration options could be implemented under Alternative D as presented in Table 2-16. Some options would result in the need to export or import material to achieve the restoration objectives. Others would result in a balanced grading scheme, eliminating the need to import or export any material other than that required for capping nest sites.

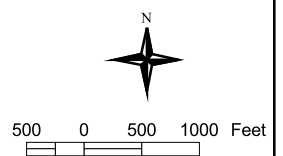
#### Habitat Management

Following the elimination of the solar salt operation, the Service would have sole responsibility for maintaining the pond levees. Management actions would also be required to control unauthorized public access on the levees and within the restored salt marsh habitat. Such actions could include fencing around the eastern perimeter of the salt ponds, installing regulatory signage around the perimeter and outer levees of the Refuge, and routine visits to the area by Refuge staff to monitor the effectiveness of fencing and signage in reducing unauthorized access. In addition, the quality of the nesting habitat on the salt pond levees would be maintained by continuing to isolate nesting areas from human disturbance, ensuring that levee surfaces remain generally open with limited vegetation, and controlling vegetation on levee slopes to provide good visibility of the surrounding area for nesting seabirds. During final restoration design, consideration would be given to providing areas of unvegetated mudflat habitat adjacent to some levees with appropriate access routes maintained for foraging snowy plover chicks and subtidal areas adjacent to other levees to maintain areas of open water along some portions of the internal levees that annually support seabird nesting.



**Figure 2-17**  
**Expected Habitats within the Salt Ponds Following Levee Breaching**  
**with No Changes to the Existing Pond Elevations**

Intertidal mudflat    Cordgrass    Salt marsh    Upland



Source: USFWS, Local Agency Partnership (2 ft imagery)

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**Table 2-16**  
**Various Restoration Scenarios<sup>1</sup> Under Alternative D**  
**with Estimated Net Grading Requirements for Each Scenario**

Estimated Net Grading Volumes (cubic yards)	Restored Salt Ponds (Modified)	Otay Option 1 + Restored Salt Ponds (Modified)	Otay Option 2 + Restored Salt Ponds (Modified)	Restored Salt Ponds (Breach Only)	Otay Option 1 + Restored Salt Ponds (Breach Only)	Otay Option 2 + Restored Salt Ponds (Breach Only)
Otay Floodplain – Cut	0	723,000	970,000	0	723,000	970,000
Otay Floodplain – Fill	0	723,000	460,600	0	549,700	460,600
Salt Works – Cut	165,700	165,700	165,700	0	0	0
Salt Works – Fill	0	0	0	0	0	0
Nesting Enhancements - Fill	173,300	173,300	173,300	173,300	173,300	173,300
Imported Nesting Substrate	127,400	127,400	127,400	127,400	127,400	127,400
Fill Material to be Imported	7,600	7,600		173,300	0	0
Fill Material to be Exported	0	0	501,800	0	0	336,100
Grading Balanced On Site <sup>2</sup>	N <sup>3</sup>	N <sup>3</sup>	N	N	Y	N

<sup>1</sup> Each scenario includes the nesting enhancements described in Alternative B, as well as the proposal to convert Pond 44 to a nesting site.

<sup>2</sup> Clean, light-colored sand would be imported to the site under any of these scenarios.

<sup>3</sup> As described previously, the grading estimates for modifying the pond elevations can be increased or decreased to achieve a balanced grading plan without compromising the desired habitat types, therefore, it is likely that the final restoration plan for this scenario would result in a grading plan that balances the cut and fill quantities on site.

Sources: (Ducks Unlimited 2004) and (David Cannon, Everest International Consulting, per. comm. 12/03)

To be effective, the pelican roosting platforms described in Alternative A should be installed in open water areas. Because the primary and some secondary ponds would be restored to tidal action under Alternative D, the platforms would have to be moved from the primary ponds to other areas of open water. If the water is deep enough, one or two of the platforms might be relocated to the managed water area, or the platforms could be installed in the bay within the Refuge's management boundary. Additional monitoring would be required for any platforms installed in the bay to determine the extent, if any, of human disturbance on roosting pelicans.

## **Public Use Program**

### **Public Access**

Public access onto this Refuge Unit would be permitted within the open waters of the bay, through guided nature tours within the salt pond complex, and along Pond 28 via a proposed interpretive trail. Improved access around the southern perimeter of the Refuge Unit would be provided on a proposed pedestrian path, as described in Alternative C. The Refuge will work with surrounding local and state agencies to identify opportunities for providing signage that directs the public to the various public access points on the Refuge.

### **Wildlife-Dependent Recreational Uses**

Fishing: Opportunities for fishing would continue to be provided within the open waters of the bay, as described in Alternative A. The expansion of fishing opportunities as described in Alternative C are not proposed under this alternative.

Wildlife Observation and Photography: This alternative includes the opportunities for wildlife observation and photography that are currently available on the Refuge Unit via boat (refer to Section 2.3.2.1, Alternative A), through the expansion of the guided tour program for the salt pond complex, and along the pedestrian path described under Alternative C. The following additional opportunities for these uses are proposed under this alternative:

- Observation points would be established along the proposed pedestrian path at the northern terminus of 7<sup>th</sup>, 8<sup>th</sup> and 10<sup>th</sup> Streets in Imperial Beach to provide observation opportunities of bird foraging and nesting activity along the Otay River channel and Ponds 10 and 23;
- An observation area would also be provided within the upland area north of the Bayshore Bikeway in the vicinity of 13<sup>th</sup> Street in Imperial Beach to provide an overview of avian activities in Ponds 22 and 23;
- Another potential observation area could be provided along the eastern edge of Pond 29 in the City of Chula Vista, (refer to Figure 2-15), but the specifics of this proposal require coordination with the Port; and
- An interpretive trail would be constructed around Pond 28 to provide visitors within the opportunity to observe wildlife within the open bay, on the salt pond levees, and within adjacent restored salt ponds.

The observation areas proposed around the perimeter of the South San Diego Bay Unit would be located on a coastal terrace that is slightly elevated above the adjacent wetlands. From these locations, visitors would be provided with views across many of the restored



salt ponds. Nesting activities on several levees could be viewed through a spotting scope or binoculars. In addition to visual access into the Refuge Unit, these locations would also provide excellent opportunities to experience the many sounds of the Refuge, particularly the unmistakable chatter emitted from the tern nesting colonies and the vocalizations of black-necked stilts (*Himantopus mexicanus*) and other shorebirds that forage along the river channel and within the adjacent ponds.

The proposed observation points would be accessible from the Bayshore Bikeway and several public streets in northern Imperial Beach. A parking area that serves users of the Bayshore Bikeway is available at the northern terminus of 13<sup>th</sup> Street and on-street parking is available along Florence Street, 8<sup>th</sup> Street, and Boulevard Avenue. Based on preliminary concepts for the observation areas, the design for the observation points at 10<sup>th</sup> and 13<sup>th</sup> Streets and adjacent to Pond 29 would be relatively informal consisting of a leveled area with either a hardened surface or a permeable surface consisting of compacted native soil or decomposed granite. A post and cable fence or other appropriate barrier would be provided at the edge of these observation areas to minimize disturbance to adjacent vegetation. An observation deck is envisioned for the 8<sup>th</sup> Street location. This deck would serve two purposes, one related to public use and the other to reduce human disturbance within the restored salt ponds. The deck would be slightly elevated above the adjacent wetland and the railing and fencing provided around the deck would be designed to reduce accessibility from the existing bike path into sensitive habitat.

A 1.5-mile wildlife observation and interpretive trail is proposed in the northeastern corner of this Refuge Unit. The trail, which would begin near Bay Boulevard, would extend west along the Palomar drainage, then head north on the levee that separates Ponds 28 and 29. The trail would then extend around the perimeter of Pond 28, which is situated at a slightly higher elevation than the ponds to the west. From this trail, visitors would have excellent views of the open bay, restored ponds, and seabird nesting areas. The trail would be designed in a manner that would enable the Service to restrict use to specific hours and seasons, if necessary. This would likely involve the installation of fencing, a gate, and appropriate signage. Use of the trail would be restricted to pedestrians and dogs would not be permitted on the trail.

The proposal to open the northern levee of Pond 11 to public access for wildlife observation would not be implemented under this alternative.

Environmental Education: The proposals for environmental education addressed in Alternative C would also be implemented under this alternative.

Environmental Interpretation: Under Alternative D, the current public use program would be expanded to include new opportunities of environmental interpretation. These opportunities would include:

- Interpretive panels and other interpretive elements to provide information about such topics as the restored habitats within the salt ponds, migration along the Pacific Flyway, the Refuge's endangered and threatened species, and nesting seabirds;
- An interpretive trail that focuses on native vegetation and the importance of environmental education;
- A 1.5-mile interpretive trail around Pond 28;



- An interpretive program to present the history of hunting within San Diego Bay and describe the importance of hunting within the Refuge System; and
- An interpretive program to describe the historical significance of the salt pond complex and the importance of solar salt production in the South Bay.

The majority of the interpretation would be provided around the southern perimeter of the bay, where visual and other sensory access into the Refuge is readily available. In general, interpretive sites would correspond with those sites selected to facilitate wildlife observation. The majority of the proposed sites would be located along the proposed pedestrian path or the Bayshore Bikeway. Potential locations for interpretation include the area around Bayside Elementary School (at the terminus of 10th Street), the northern terminus of 8th Street, and an area located between the terminus of 13th Street and Florence Street. An initial step in creating an environmental interpretation program for the Refuge would involve the development of a step-down interpretive plan. Within the plan, the interpretive theme for each interpretive site, the types of interpretive elements to be installed, and a detailed cost estimates for each site would be identified. The step-down plan would also examine opportunities for additional interpretation at existing public use locations where interpretive elements, such as kiosks, signs, remote television cameras and other cutting edge approaches to public interpretation, could be provided.

An interpretive walk is proposed along the upland terrace near the terminus of 13th Street. This area would be restored to native upland as part of the Refuge's Habitat Heroes environmental education program. The site provides an excellent opportunity to use various interpretive elements to illustrate the importance of preserving coastal upland vegetation in proximity to coastal wetlands. The design of this pathway and the associated interpretive elements would be developed as part of the step-down interpretive plan.

Interpretation of the resources to be observed along the Pond 28 interpretive trail could be provided using various interpretive elements installed along the trail, via a trail brochure, and/or through docent-led nature tours.

The development of a program to interpret the historic hunting activities in San Diego Bay and the importance of hunting within the Refuge System is also proposed under this alternative. The program, which would address one of the traditional wildlife-dependent recreational uses of the National Wildlife Refuge System, would be conducted along the outer salt pond levees. This interpretive hunting experience would be conducted seasonally along the outer levees of the salt ponds and would describe what hunting within the South Bay habitats might have been like in the early part of the 1900s. The current opportunities for hunting within the Refuge System would also be addressed. This program would be conducted approximately four times a year between November and January and would involve up to 12 participants per session. Each session would take place between sunrise and 9:00 a.m. One or two temporary hunting blinds would be installed along the northern levee to create an air of authenticity. Participants would be transported from an off Refuge location to the salt ponds. Reservations would be required to participate; however, no fee would be collected from the participants.

To preserve the historic context of the area, an interpretive program would also be developed to present the long history of solar salt production at this location. The interpretive program would include the preservation of various elements associated with

the operation, a pictorial history of the operation over the years, and an interpretive display of artifacts from the facility. Facts about the significance of the facility to salt production in general and to the past and present economy of the San Diego region would also be provided. The primary salt processing area associated with the salt works is located on property outside the Refuge boundary; therefore, the Service would work in partnership with the Airport Authority and others to develop a meaningful interpretive program for the entire salt works facility. Portions of the Pond 28 trail might also be used to facilitate interpretation of the salt works.

### **Other Public Uses**

Recreational Boating: Recreational boating would continue to be permitted within Refuge waters, provided these activities are conducted in accordance with the existing five mph speed limit. This issue could be revisited should problems arise in the future related to wildlife disturbance from the various boating activities occurring on the Refuge.

Otay Valley Regional Trail: The proposed route for the Otay Valley Regional Trail, as described in Alternative C, is also included under this alternative.

### **Other Uses**

Refuge Facilities: This alternative includes a proposal to explore the potential for constructing a Refuge Complex office within the South San Diego Bay Unit on a 0.71-acre parcel located to the south of the Bayshore Bikeway and the east of 12<sup>th</sup> Street in Imperial Beach. Such a proposal would require coordination with the State Lands Commission and the City of Imperial Beach; the initiation of a public outreach program to obtain input from surrounding residents; and completion of required environmental documentation.

Solar Salt Production: Solar salt production would be eliminated under this alternative. The operation may be closed at the commencement of salt pond restoration or the current operation could be phased out in association with a phased restoration process (refer to the previous discussion regarding Construction Phasing).

### **Environmental Contaminants**

Prior to commencement of restoration actions on the Refuge, any contaminant investigations and/or baseline sampling recommendations included in the CAP would be completed and proposed remediation actions would be implemented prior to or in association with restoration.

### **Cultural Resource Management**

Under this alternative, the solar salt operation would be discontinued. Prior to any restoration of the salt ponds, an analysis of the effects of restoration on use, design, and function of the salt works would be completed in accordance with the requirements of the NHPA. A treatment plan for mitigating the adverse effects to the salt works caused by the proposed restoration activities would also be prepared and implemented. It is likely that the treatment plan would include a proposal to interpret the historic significance of the salt works operation; consequently, the development of such an interpretive program is included in this alternative as part of the environmental interpretation proposals (refer to the Public Use section presented above).

In addition, a cultural resource survey would be conducted of the Otay River floodplain and site testing would occur to determine the eligibility to the NRHP of sites identified during

the survey, as well as any previously identified sites that have not yet been evaluated. The eligibility determinations, assessment of project effects, and treatment plans would require consultation with SHPO and other interested parties.

As described in Alternative C, the Service would work with federally recognized tribes, historical societies and museums, the SHPO, and other interested parties in developing a cultural resources management plan for the Refuge. The plan would comply with the NHPA, NAGPRA, and other regulations and policies related to cultural resources.

### **Step-Down Management Plans**

#### **Fire Management Plan**

Implementation of either of the restoration options for the Otay River floodplain would restore weedy upland vegetation to native habitat, which would reduce the need for some of the fire suppression activities described in the fire management plan for this portion of the Refuge. All other aspects of the fire management plan, as described in Alternative A, would be unaffected by the proposals included in this alternative.

#### **Predator Management Plan**

Predator management would generally be implemented as described in Alternative A for the Sweetwater Marsh Unit. However, to address the predation issues for the listed species that would be supported in the restored portions of the Refuge Unit, the following additional measures would be implemented: install fencing along the eastern perimeter of the Refuge in the vicinity of the salt ponds to reduce the accessibility of the nesting colonies to mammalian predators; construct artificial nesting platforms in restored marsh areas to provide cover for roosting and nesting clapper rails; and experiment with various perching deterrents along the levees to reduce avian predation. A detailed discussion of the predator management plan is presented in Appendix M.

### **2.3.3 Alternatives Considered but Eliminated from Detailed Study**

The alternatives development process is designed to allow consideration of the widest possible range of issues and potential management approaches. During this process, various objectives and strategies for achieving Refuge goals were considered but not selected for detailed study. Those alternatives that were eliminated from detailed study are presented below.

#### **2.3.3.1 Additional Restoration Options for the Salt Works**

Early in the planning process, the CCP team considered a variety of restoration options for the salt works. From these, nine conceptual restoration proposals, including a no action option, were designed and presented to the public for review and comment. Of the nine options, five have been incorporated into the alternatives presented above and four were eliminated from detailed study.

The options that were eliminated included:

- Widening the existing Otay River channel between the western and eastern salt ponds to improve the conveyance of flood waters;
- Widening the river channel in combination with restoring the Otay River floodplain;
- Realigning and broadening the Otay River within the Otay River floodplain to eliminate the bend in the river and removing the levees in Ponds 10, 11, 12, and 23 and a portion of the levees from Ponds 13 and 22 to better accommodate river flows; and,

- Removing all of the pond levees to create a gently sloping marsh plain from the Otay River to the existing intertidal mudflats located to the north of the salt works.

The options related to widening the Otay River were eliminated from further study when it was determined that this change would not achieve the desired goal of protecting the salt ponds from impacts during significant flood flows in the Otay River. The realignment and broadening of the Otay River was dropped from further consideration due to the adverse impacts this proposal would have on the railroad right-of-way, which is located outside the Refuge boundaries. The restoration option involving the complete removal of the levees within the salt works would result in the loss in historical nesting habitat for least terns and a variety of colonial nesting seabirds; therefore, it too was eliminated from further study.

### **2.3.3.2 Restore Eelgrass and Mudflat Habitat Near Emory Cove**

During preliminary discussions about potential restoration options within the South San Diego Bay Unit, consideration was given to restoring a portion of a previously dredged channel leading to Emory Cove. Historic habitats considered for restoration included intertidal mudflats and shallow subtidal habitat. Filling the channel could facilitate the reestablishment of eelgrass beds and mudflat habitat in the Emory Cove area. This proposal was not studied in detail because of the need for additional coordination with other partners, as well as funding constraints. This restoration concept would likely be reevaluated in future years when the proposals in the CCP are reviewed and updated as appropriate.

### **2.3.3.3 Opening the Refuge for Waterfowl Hunting**

Hunting is one of the six wildlife-dependent recreational uses that are to receive priority consideration in Refuge planning. Opening the South San Diego Bay Unit to waterfowl hunting was initially proposed as a component of one of the management alternatives. The waterfowl areas within the Refuge are located on property owned by the State of California and leased to the Service for management as a National Wildlife Refuge. In light of the broad based concern with implementing a hunting program in proximity to urban areas, the proposal has been eliminated from further study at this time.

### **2.3.3.4 Alternative Predator Management Proposals**

Refer to Section 2.2.3.4 for a discussion of the various predator management proposals that were considered, but eliminated from further study.

## **2.3.4 Comparison of Alternatives by Issue**

Table 2-17 presents an issue-by-issue comparison of the four alternatives for this Refuge Unit.

Table 2-17  
Comparison of Alternatives for the South San Diego Bay Unit by Issue

	Alternative A	Alternative B	Alternative C	Alternative D – Preferred Alt.
Issues				
<b>Wildlife/Habitat Management</b>				
<b>Manage wintering and breeding birds as a priority</b>	<ul style="list-style-type: none"> <li>Annually monitor nesting seabirds per available funding</li> <li>Minimize human disturbance around the salt ponds throughout the year, and prohibit public use during the nesting season</li> </ul>	<ul style="list-style-type: none"> <li>Implement the proposals in Alternative A</li> <li>Enhance nesting substrate on the salt pond levees and create a minimum of 25 acres of additional nesting area in the salt works</li> <li>Seasonally regulate the water levels in Pond 20 to provide nesting and foraging habitat for western snowy plovers</li> </ul>	<ul style="list-style-type: none"> <li>Implement the proposals in Alternative B</li> <li>In association with pond restoration, maintain quality nesting habitat on the salt pond levees</li> <li>Continue solar salt production within a reduced footprint to provide a source of brine invertebrates for various migratory bird species</li> </ul>	<ul style="list-style-type: none"> <li>Implement the proposals in Alternative B (but provide at least 33 acres of new nesting area)</li> <li>Restore tidal influence to various salt ponds to benefit <u>fish and migratory birds</u></li> <li>Manage some ponds to produce brine flies and brine shrimp as prey for specific species of migratory birds</li> </ul>
<b>Restore coastal wetlands to support fish and wildlife</b>	<ul style="list-style-type: none"> <li>Implement no new restoration proposals</li> </ul>	<ul style="list-style-type: none"> <li>Implement no new restoration proposals, but provide new seabird nesting habitat</li> </ul>	<ul style="list-style-type: none"> <li><u>Restore tidal influence to between 200 and 440 acres of salt ponds</u></li> <li>Restore between 65 and 90 acres of intertidal wetlands and 35 to 60 acres of upland habitat in the Otay River floodplain</li> </ul>	<ul style="list-style-type: none"> <li><u>Restore tidal influence to 650 acres of salt ponds</u></li> <li>Restore between 65 and 90 acres of intertidal wetlands and 35 to 60 acres of upland habitat in the Otay River floodplain</li> </ul>

**Table 2-17 (continued)**  
**Comparison of Alternatives for the South San Diego Bay Unit by Issue**

Issue	Alternative A	Alternative B	Alternative C	Alternative D – Preferred Alt.
<b><i>Wildlife/Habitat Management (continued)</i></b>				
<b>Protect habitat values for all species, not just listed species</b>	<ul style="list-style-type: none"> <li>Maintain current management practices</li> </ul>	<ul style="list-style-type: none"> <li>Expand current management practices to include enhancing the salt pond levees to improve the quality of nesting habitat for various seabird species</li> </ul>	<ul style="list-style-type: none"> <li><u>Restore tidal influence to salt ponds</u> while preserving/enhancing levees for seabird nesting and <u>migratory bird roosting</u> during high tides</li> <li>Restore tidal wetlands to increase habitat for fish, wildlife, invertebrates</li> </ul>	<ul style="list-style-type: none"> <li>Similar to Alternative C, but increase the number of ponds to be restored to tidal influence</li> <li>Maintain some ponds for the production of brine invertebrates to continue to support eared grebes and phalaropes</li> </ul>
<b>Restore upland and wetland habitat in the Otay River floodplain</b>	<ul style="list-style-type: none"> <li>Implement no new restoration proposals</li> </ul>	<ul style="list-style-type: none"> <li>Implement no new restoration proposals</li> </ul>	<ul style="list-style-type: none"> <li>Restore 65 acres of intertidal wetlands and 60 acres of uplands under Restoration Option 1 or 90 acres of intertidal wetlands and 35 acres of uplands under Option 2</li> </ul>	<ul style="list-style-type: none"> <li>Same as Alternative C</li> </ul>
<b>Address adverse effects of predation on listed species</b>	<ul style="list-style-type: none"> <li>Implement a predator management plan to protect least terns and western snowy plovers nesting at the salt works and light-footed clapper rails active in the Otay River floodplain</li> </ul>	<ul style="list-style-type: none"> <li>Manage predators as described in Alternative A</li> </ul>	<ul style="list-style-type: none"> <li>Manage predators as described in Alternative A and added fencing as necessary to protect restored areas from intrusion by mammalian predators</li> </ul>	<ul style="list-style-type: none"> <li>Manage predators as described in Alternative A and fence the eastern boundary of the salt ponds to protect restored areas from intrusion by mammalian predators</li> </ul>



Table 2-17 (continued) Comparison of Alternatives for the South San Diego Bay Unit by Issue				
Issue	Alternative A	Alternative B	Alternative C	Alternative D – Preferred Alt.
<b>Public Use</b>				
<b>Open the salt works to public access</b>	<ul style="list-style-type: none"> <li>Continue to provide occasional guided nature tours at the salt works</li> </ul>	<ul style="list-style-type: none"> <li>Same as Alternative A</li> </ul>	<ul style="list-style-type: none"> <li>Increase the number of guided nature tours at the salt works to two per month outside of the nesting season</li> </ul>	<ul style="list-style-type: none"> <li>Same as Alternative C, plus develop an interpretive program to present the history of waterfowl hunting in San Diego Bay</li> </ul>
<b>Expand opportunities for priority public uses</b>	<ul style="list-style-type: none"> <li>Maintain current public uses including fishing, wildlife observation, environmental education, and boating</li> </ul>	<ul style="list-style-type: none"> <li>Same as Alternative A</li> </ul>	<ul style="list-style-type: none"> <li>Expand fishing and wildlife observation opportunities by opening a levee to public access; increase guided nature tours of the salt works; accommodate a portion of the Otay Valley Regional Trail (OVRT); develop a boardwalk to the south of Pond 10</li> </ul>	<ul style="list-style-type: none"> <li>Maintain current fishing, environmental education, and boating activities; increase guided nature tours; accommodate the OVRT; and provide new opportunities for wildlife observation and interpretation at Pond 28 and around the Unit's southern perimeter</li> </ul>
<b>Permit waterfowl hunting on this Unit</b>	<ul style="list-style-type: none"> <li>Unit closed to hunting</li> </ul>	<ul style="list-style-type: none"> <li>Same as Alternative A</li> </ul>	<ul style="list-style-type: none"> <li>Same as Alternative A</li> </ul>	<ul style="list-style-type: none"> <li>Same as Alternative A</li> </ul>
<b>Other Issues</b>				
<b>Seek management authority for all areas within the approved acquisition boundary</b>	<ul style="list-style-type: none"> <li>Continue to work with the Port to incorporate into the refuge those portions of the south bay included in the approved acquisition boundary</li> </ul>	<ul style="list-style-type: none"> <li>Same as Alternative A</li> </ul>	<ul style="list-style-type: none"> <li>Same as Alternative A</li> </ul>	<ul style="list-style-type: none"> <li>Same as Alternative A</li> </ul>

## 2.3.5 Refuge Management Direction: Goals, Objectives, and Strategies

### 2.3.5.1 Overview

Goals and objectives are the unifying element of Refuge management. They are intended to identify and focus management priorities and provide a link between management actions, Refuge purposes, and NWRs mission and goals. For more information about goals, objectives, and strategies, refer to Section 2.2.5.

The goals for the South San Diego Bay Unit, as presented in Section 1.8.2, apply to all four of the alternatives evaluated for this Refuge Unit. The following section includes objective statements and associated strategies for each Refuge goal. The objectives have been written to address the Preferred Alternative (Alternative D). In addition, the various strategies that would implement the objective in whole or in part are provided in a table format that allows the reader to determine which strategies would be implemented under each alternative. Specific acreage figures, time frames, and other measurable elements presented in the objectives may change depending upon which alternative is finally selected for implementation.

### 2.3.5.2 Description of the Goals, Objectives and Strategies

The proposed objectives and strategies are listed below as they apply to the five Refuge goals.

**GOAL 1: Protect, manage, enhance, and restore open water, coastal wetlands, and native upland habitat to benefit the native fish, wildlife, and plant species supported within the South San Diego Bay Unit.**

***Objective 1.1: Incorporate In-holdings Into Refuge Management Area***

*Within ten years of the CCP's approval, increase the total acreage of the Refuge to approximately 3,400 acres by incorporating into the Refuge most of the open water areas of the bay currently included within the approved acquisition boundary.*

**Rationale:** Much of San Diego Bay's shallow water environment, including eelgrass beds, has been eliminated over the years due to urban development. Of the shallow water habitat that remains, the vast majority is located in the southern end of the bay, where some, but not all, is included within the current boundary of the South San Diego Bay Unit. Approximately 1,000 acres of shallow water habitat are included within the approved Refuge acquisition boundary, but have yet to be leased to the Service for management. As a result, wildlife needs in these areas are not actively protected from disturbance. Extending the Service's management authority over these remaining areas would ensure uniform enforcement of existing regulations, such as the 5-mile per hour speed limit, to minimize disturbance to wildlife and protect sensitive eelgrass beds that support migratory birds, fish, and several listed species, including the California least tern and green sea turtle.

Objective 1.1 - Incorporate In-holdings Into Refuge Management Area				
Comparison by Alternative				
Alternative				Strategy
A	B	C	D	
✓	✓	✓	✓	Continue working with the Port to obtain a lease or management agreement for approximately 1,000 acres of the open bay included within the approved acquisition boundary but not yet included within the Refuge boundary.

***Objective 1.2: Restore Native Habitats in the Otay River Floodplain***

*When funding is available, restore the Otay River floodplain to a mix of a minimum of 65 acres of intertidal wetlands (consisting of 50 percent intertidal mudflat, 30 percent cordgrass-dominated salt marsh, and 20 percent pickleweed-dominated salt marsh), at least 15 acres of freshwater wetland habitats (containing a mix of freshwater marsh, riparian scrub, and riparian woodland vegetation), and a minimum of 35 acres of native uplands (consisting of 50 percent perennial native upland shrub species and less than five percent cover of exotic species) to support native wetland and upland species.*

***Rationale:*** The Otay River floodplain has been subject to human disturbance associated with solar salt production, agriculture, and public utilities for more than 100 years. As a result, the only native habitats present are the narrow areas of southern willow scrub and pickleweed-dominated salt marsh that occur along the edges of Otay River channel. In its current state, this area represents an excellent opportunity for restoring the variety of native habitats that occurred here in the past. Restoration to provide freshwater wetlands, native upland, and intertidal habitat would support the Refuge purpose of protecting and restoring habitats for federally-listed endangered and threatened species and migratory birds. This proposal is also consistent with 1) the recommendations of the Southern Pacific Shorebird Conservation Plan (Hickey et al. 2003), which calls for the restoration of tidal flats and marshes on the southern California coast; 2) the management actions of the Light-footed Clapper Rail Recovery Plan (USFWS 1985c), which identifies the need to improve tidal action at the Otay River mouth and expand nesting habitat; and 3) the recovery actions of the draft Least Bell's Vireo Recovery Plan (USFWS 1998), which recommends the restoration of potential or degraded habitat to support the recovery of this species.

Objective 1.2 - Restore Native Habitats in the Otay River Floodplain <i>Comparison by Alternative</i>				
<i>Alternative</i>				<i>Strategy</i>
A	B	C	D	
		✓	✓	Seek funding by partnering with others to prepare construction-level restoration plans for the restoration of 145 acres in the Otay River floodplain.
		✓	✓	Establish partners and seek funding to implement the proposed restoration of the Otay River floodplain.
		✓	✓	Develop and implement a monitoring program to document natural recruitment of intertidal vegetation, <u>establishment of freshwater wetland habitats</u> , and fish and wildlife responses to restoration.

***Objective 1.3: Restore Tidal Wetlands at the Salt Works***

*When funding is identified, restore approximately 650 acres of salt ponds to tidal influence, providing a mix of habitat types that include shallow subtidal, intertidal mudflats, tidal channels and associated tidal flats, cordgrass-dominated salt marsh, and pickleweed-dominated salt marsh.*

***Rationale:*** It is estimated that 88 percent of the historic salt marsh habitat and 92 percent of the original intertidal habitat (excluding salt marsh habitat) in San Diego Bay have been lost to dredging or filling (U.S. Navy 2000). Statewide, 80 percent of California's coastal wetlands have been converted to urban or agricultural use (USFWS 1999). This significant loss in coastal wetland habitat has led to a decline in several native species that are now federally-

listed as threatened or endangered. The loss of these wetlands also represents a significant loss in habitat for many species of migratory shorebirds (Hickey *et al.* 2003). The proposal to restore tidal wetlands is supported by the recovery actions recommended for the light-footed clapper rail, as well as the recommended actions included in Southern Pacific Shorebird Conservation Plan (Hickey *et al.* 2003).

Objective 1.3 - Restore Tidal Wetlands at the Salt Works				
<i>Comparison by Alternative</i>				
<i>Alternative</i>				<i>Strategy</i>
A	B	C	D	
		✓	✓	<u>Conduct project-level planning for the restoration of the salt works that involves 1) the completion of various baseline studies and other analyses, development of detailed restoration and engineering plans that are flexible enough to allow for changes based on monitoring results, 2) the preparation of appropriate environmental documentation, 3) public participation, and 4) the acquisition of all required permits and approvals.</u>
		✓		Establish partners and seek funding sources to restore a minimum of 200 acres and a maximum of 440 acres of intertidal wetlands within the salt works.
			✓	Establish partners and seek funding sources to restore approximately 650 acres of intertidal wetlands within the existing salt ponds.
		✓	✓	Develop and implement a monitoring program to document natural recruitment of intertidal vegetation and fish and wildlife response to restoration.
			✓	<u>Prepare and implement a restoration plan for the salt ponds that incorporates monitoring and an adaptive management approach to restoration.</u>
		✓	✓	<u>During and following restoration, maintain conditions within the salt pond system that support ground nesting seabirds and shorebirds, a brine invertebrate population, and nesting and foraging habitat for California least terns and western snowy plovers.</u>

***Objective 1.4: Reduce Human Disturbance***

*Within three years of CCP approval, implement new law enforcement activities on the Refuge that will reduce speeding on the open bay to no more than five violations per month, reduce illegal trespass on Refuge lands to not more than six contacts per month, and result in a 75% reduction in the number of vandalism incidents reported in FY 05.*

***Rationale:*** Human presence on the water or along the shoreline can disturb roosting and foraging shorebirds and can cause nesting birds to temporarily abandon their nests. Various studies on the effects of wildlife disturbance have shown that general bird use decreases as frequency of disturbance increases (DeLong and Schmidt 2002). Disturbance compounds the effects of coastal wetland loss for birds and other wildlife that depend upon coastal wetlands for survival. Control of human disturbance is a recommended action of the light-footed clapper rail and California least tern recovery plans (USFWS 1985a, 1985c) and the Southern Pacific Shorebird Conservation Plan (Hickey *et al.* 2003).

Objective 1.4 - Reduce Human Disturbance				
<i>Comparison by Alternative</i>				
<i>Alternative</i>				<i>Strategy</i>
A	B	C	D	
✓	✓	✓	✓	Coordinate with the U.S. Coast Guard and the Harbor Patrol to enforce the 5 mile per hour speed limit throughout the South Bay.
✓	✓	✓	✓	Continue weekly patrols to identify and remove illegal encampments in the Otay River floodplain, while also encouraging adjacent public landowners to control similar encampments on their properties.
✓	✓	✓	✓	Maintain communications between the Refuge law enforcement officer and other Refuge staff, and conduct monitoring to ensure rapid response to potential trespass/vandalism problems.
✓	✓	✓		Continue to prohibit salt works-related activity on the outer levees of the salt ponds from March 15 through September 15.
✓	✓	✓	✓	Limit all activities on the outer levees during the nesting season.
✓	✓		✓	Prohibit public access on the levees around Ponds 10 and 11.
		✓	✓	Immediately following the breaching of <u>any</u> of the western ponds, install fencing and/or other appropriate barriers around the <u>breached</u> pond(s) as needed to minimize disturbance to migratory <u>and resident</u> birds.
	✓	✓	✓	Secure a patrol boat / trailer to facilitate a law enforcement presence on the open waters of the Refuge within one year of CCP approval.
			✓	Within one month of the closure of the salt works, install fencing and signage to minimize unauthorized access into the salt pond complex.

***Objective 1.5: Identify and Remediate Environmental Contaminant Issues***

*Within three years of identifying a funding source, work with the Service's Division of Environmental Contaminants to develop and implement a baseline sampling plan for determining the extent and nature the Refuge's known or suspected containment areas, as identified in the CAP, and develop and implement a water quality monitoring program to characterize the quality of water entering the Refuge from upstream sources.*

**Rationale:** Understanding and addressing the threats that may exist to Refuge trust species due to the presence of environmental contaminants in the soil and water is an important part of protecting and managing Refuge habitats for the benefit of fish and wildlife. Various studies of San Diego Bay have documented the presence of constituents of concern within the water column, as well as within bay sediments. These and other contaminants may bioaccumulate in invertebrates, fish, and plants and eventually be transferred to avian and terrestrial species that feed on these organisms. In addition, initial contaminants assessments indicate the widespread presence of organochlorine pesticides and the presence of elevated levels of some metals within the Otay River floodplain. The initiation of baseline sampling is required to fully assess the potential threat to Refuge resources posed by these contaminants. Depending upon the results of baseline sampling, more detailed contaminants investigations and/or clean up or remediation efforts could be warranted.

Several surface water transport pathways are also present that could affect water quality within the Refuge. These include the Otay River, the drainage channels at Palomar Street and Main Street, Nestor Creek, and the drainage outfalls entering the Refuge from the City of Imperial Beach. Water quality monitoring is only occurring within a few of these drainages.

Objective 1.5 – Contaminant Issues <i>Comparison by Alternative</i>				
Alternative				Strategy
A	B	C	D	
	✓	✓	✓	Seek funding for, develop, and implement a baseline sampling plan based on the recommends included in the CAP.
		✓	✓	Once funding is identified, remove or otherwise remediate the soils within the Otay River floodplain containing elevated levels of organochlorine pesticides.
	✓	✓	✓	Seek funding to implement wet and dry weather water quality monitoring within the South San Diego Bay Unit. This monitoring effort should target surface water that is entering the Refuge via the Otay River, the Palomar and Main Street drainages, and Nestor Creek.

**Objective 1.6: Spill Contingency Plan**

*By FY 2008, develop a site-specific contingency plan for the Refuge that provides Refuge staff with guidance on the safe and effective response to a hazardous substance spill within or upstream of the Refuge and includes a public outreach component to inform the public, appropriate agencies, and upstream landowners and businesses of the notification procedures that should be taken if a spill occurs upstream of the Refuge.*

**Rationale:** The Refuge is located at the bottom of the watershed that supports a variety of commercial and industrial uses. Several potential transport pathways have been identified in the CAP that could provide a pathway for hazardous materials from an accidental spill to enter the Refuge's sensitive coastal wetlands. To ensure that safe and effective responses are implemented in a manner that best protect fish and wildlife resources and their habitats in the event of a spill, it is essential that a spill contingency plan be developed for the Refuge. Spills are more easily contained in early stages and near the source. A contingency plan would facilitate prompt notification of appropriate staff and provide for the effective execution of containment and cleanup measures.

Objective 1.6 – Spill Contingency Plan <i>Comparison by Alternative</i>				
Alternative				Strategy
A	B	C	D	
	✓	✓	✓	By FY 2008, complete a spill contingency plan for the Refuge and begin public outreach to ensure prompt notification in the event of a spill.
	✓	✓	✓	Once funding is identified, characterize the baseline contaminants conditions on the Refuge to document pre-spill conditions.

**Objective 1.7: Reduce the Accumulation of Fishing Line**

*Within three years of CCP approval, develop a Monofilament Recovery and Recycling Program (MRRP), modeled after the MRRP developed by the Florida Fish and Wildlife Conservation Commission, to educate the public about the problems caused by monofilament fishing line left in the environment, to encourage recycling of the line, to conduct volunteer monofilament line cleanup events, and to reduce the accumulation of fishing line, hooks, and other debris encountered in the South Bay by 90 percent over a two year period.*



**Rationale:** Discarded fishing line represents a serious threat to birds, particularly fish-eating birds. Entanglement with fishing line results in the death of many birds in South San Diego Bay, as documented by Refuge field staff. It is not unusual to observe up to several dead or dying birds entangled in one length of fishing line within the more dense nesting colonies on the salt pond levees. Species affected include the California brown pelican, California least tern, and many other species of terns and shorebirds. Other discarded materials, such as various forms of plastic, can result in injury or death for a variety of bird species and can also pose a threat to the bay's population of green sea turtles.

This problem can be reduced through the initiation of a public outreach program that would inform the public of the threat discarded fishing line poses for the Refuge's wildlife. Different audiences would be targeted through the use of a brochure aimed at the recreational fishing community and an annual clean-up event that would attract a larger segment of the community. Success would be monitored by surveying the shoreline and outer levees on a quarterly basis to determine if and to what extent the accumulation of fishing line and other debris has been reduced over previous years.

Objective 1.7 - Reduce the Accumulation of Fishing Line				
<i>Comparison by Alternative</i>				
<i>Alternative</i>				<i>Strategy</i>
A	B	C	D	
✓	✓	✓	✓	Continue to support the Port's efforts to inform the public about the impacts to wildlife of improperly disposing of fishing hooks and monofilament fishing line.
	✓	✓	✓	Expand the efforts initiated by the Port by developing a <u>MRRP modeled after the programs initiated in Florida. The program would include the development and distribution of a multi-lingual informational brochure aimed at both the recreational fishing community and the community at large that describes the threat to wildlife of improperly disposing of fishing line and other debris.</u>
	✓	✓	✓	In collaboration with State and local agencies and non-governmental organizations, sponsor an annual clean-up and public awareness event that focuses on fishing line clean-up activities throughout the bay.

**GOAL 2:**      **Support recovery and protection efforts for federally and state listed threatened and endangered species and species of concern that occur within the South San Diego Bay Unit.**

**Objective 2.1: California Least Tern Nesting**

*When funding is identified, increase the area of suitable nesting habitat for California least terns by creating at least 36 acres of nesting habitat within the salt pond complex consisting of several round or square areas greater than two acres in size capped with six to twelve inches of light sand and shell fragments. This new nesting habitat would be placed in proximity to productive foraging areas to support an average of one fledged chick per least tern nest over a fifteen year period, with at least 60 nests established annually following restoration.*

**Rationale:** California least terns historically nested along sandy beaches close to estuaries and embayments along the coast of California. However, human encroachment along the coast has severely diminished the availability of suitable nesting habitat. As a result, tern colonies are now restricted to small discrete areas of intensively managed habitat, as is the case on this

Refuge Unit. Least tern nesting at the salt works has been regular over many years, but not always successful. This is due primarily to mammalian and avian predation. Other factors that contribute to poor nesting success include human disturbance and inadequate nesting substrate. Increasing the acreage and quality of available nesting habitat would increase opportunities for least tern nesting, while also reducing crowding and conflicts with other birds that nest at the salt works.

Objective 2.1 - California Least Tern Nesting <i>Comparison by Alternative</i>				
<i>Alternative</i>				<i>Strategy</i>
A	B	C	D	
✓	✓	✓	✓	Improve the nesting substrate on up to three acres of salt pond levees per a Cooperative Agreement with the Port by 2008.
✓	✓	✓	✓	Continue to conduct predator management around the salt ponds to improve nesting success for the California least tern.
✓	✓	✓	✓	Continue to monitor nesting season activity, fledgling productivity, and type and extent of predation at the salt works.
	✓	✓	✓	Enhance at least seven acres of levees by recontouring the tops and side slopes to achieve a maximum slope gradient of 4:1, and then cap the enhanced levees with six to twelve inches of light colored sand.
	✓	✓		Increase nesting opportunities by creating <u>at least 18 acres</u> of new nesting areas within the salt ponds and capping these areas with sand.
			✓	Increase nesting opportunities by creating <u>36 acres</u> of new nesting areas within the salt ponds and capping these areas with sand.
			✓	<u>Upon closure of the commercial salt operation, install additional fencing around the salt pond complex and across certain levees, as deemed appropriate, to minimize human disturbance and unauthorized access onto the salt pond levees.</u>

***Objective 2.2: California Least Tern Foraging***

*When funding is identified, restore at least 200 acres of existing salt pond habitat to tidal influence to increase foraging habitat for the California least tern.*

**Rationale:** The reproductive success of least terns is dependent not only on the availability of suitable undisturbed nesting sites, but also on the proximity of these nesting areas to waters with adequate supplies of appropriately sized foraging fish. Least terns generally prey on fish obtained from shallow estuaries and lagoons, although some colonies occasionally forage in the ocean (USFWS 1985a). When feeding itself, a least tern will typically travel farther and capture larger fish; however, when feeding newly hatched chicks, the tern must capture very small fish and make frequent trips to nearby shallows (Massey 1988, Cimberg and Dock 1988, Keane 1996). The reintroduction of tidal influence into portions of the salt ponds would provide additional habitat for fish, particularly smaller fish, in proximity to existing and potentially new least tern nesting areas. Enhancing foraging opportunities in proximity to nesting areas is expected to support increased least tern reproductive success within the Refuge Unit.

Objective 2.2 - California Least Tern Foraging <i>Comparison by Alternative</i>				
<i>Alternative</i>				<i>Strategy</i>
A	B	C	D	
✓	✓			Restore tidal influence in Pond 28 or 29 to create additional foraging habitat for the least tern by 2008.
		✓		Restore a minimum of 200 acres and a maximum of 440 acres of intertidal wetlands within the salt ponds.
			✓	Restore approximately 650 acres of intertidal wetlands within the existing salt ponds.

***Objective 2.3: Light-footed Clapper Rail***

*Within five years of initial restoration, achieve 50 percent coverage of cordgrass over approximately 470 acres within the South San Diego Bay Unit. The height of 25 percent of the plants should be in excess of 60 centimeters (cm) and of this, at least 10 percent reaching >90 cm in height. The ultimate goal is to achieve a density of at least 100 stems per square meter (m<sup>2</sup>) with at least 90 stems/m<sup>2</sup> reaching a height in excess of 60 centimeters (cm) and of this, at least 30 stems/m<sup>2</sup> reaching >90 cm in height (Zedler 1993) over a minimum of 300 acres within ten years of initial restoration.*

**Rationale:** The substantial loss of wetlands along the California coast is the primary cause for the drastic decline in the light-footed clapper rail population, although other factors such as predation by raptors and mammals have also contributed to this decline. The prime objective of the Recovery Plan for the clapper rail is to increase the breeding population of this species by preserving, restoring, and/or creating adequately protected, suitably managed wetland habitat consisting of at least 50 percent marsh vegetation (*USFWS 1985c*). Implementation of the CCP would support the Recovery Plan's primary objective.

Objective 2.3 - Light-footed Clapper Rail <i>Comparison by Alternative</i>				
<i>Alternative</i>				<i>Strategy</i>
A	B	C	D	
✓	✓	✓	✓	Continue to conduct predator management to reduce the loss of light-footed clapper rail adults, chicks, and eggs to avian and mammalian predators.
		✓	✓	Develop restoration plans for the salt ponds and Otay River floodplain that take into consideration the habitat needs of the clapper rail. These plans should ensure adequate areas of cordgrass habitat, as well as areas of isolated hummocks or small berms to support upper-marsh vegetation needed to provide the rails with shelter during extreme high tides.
		✓		Restore a minimum of 180 acres of cordgrass-dominated salt marsh within the Otay River floodplain and salt ponds.
			✓	Restore a minimum of 470 acres of cordgrass-dominated salt marsh within the Otay River floodplain and salt ponds.
		✓	✓	Following restoration, annually monitor the restored areas to determine the status, breeding locations, and habitat utilization patterns of the Refuge's light-footed clapper rail population.

**Objective 2.4: Western Snowy Plover**

*Once restoration of the salt ponds begins, seasonally regulate the water level in one of the ponds proposed for water management to provide a minimum of 25 acres of dry salt flats capable of supporting within five years of restoration 20 snowy plover nests per season with a an average of at least one fledged chick per male snowy plover over a 15-year period.*

**Rationale:** Human disturbance, predation, and inclement weather, combined with permanent or long-term loss of nesting habitat, have led to the decline in active nesting colonies, as well as an overall decline in the breeding and wintering population of western snowy plovers along the Pacific coast. The greatest losses of habitat to support this species have occurred in southern California, where breeding western snowy plovers have been extirpated from parts of San Diego, Ventura, and Santa Barbara counties, most of Orange County, and all of Los Angeles County. Providing nesting habitat suitable for plover nesting within the salt works would support current recovery efforts for the species.

Objective 2.4 - Western Snowy Plover				
Comparison by Alternative				
Alternative				Strategy
A	B	C	D	
✓	✓	✓	✓	Continue to monitor snowy plover nesting activity, fledging productivity, and type and extent of predation at the salt works.
✓	✓	✓	✓	Continue to conduct predator management within the salt works to improve nesting success for the western snowy plover.
	✓	✓	✓	Develop and implement a plan to regulate water levels in <u>one of the managed ponds</u> to provide a minimum of 25 acres of dry salt flats within the pond.
		✓		<u>In addition to providing 25 acres of dry salt flats, create at least 18 acres of new nesting habitat within the salt pond complex</u>
			✓	<u>In addition to providing 25 acres of dry salt flats, create 36 acres of new nesting habitat within the salt pond complex.</u>
	✓	✓	✓	<u>Use fencing and exclosures to protect snowy plover chicks and eggs from predation and close the salt pond levees to all activity except monitoring and predator management during the nesting season.</u>

**Objective 2.5: California Brown Pelican**

*Maintain and protect appropriate pelican roosting habitat within the South San Diego Bay Unit and implement management actions to maintain or expand current numbers of roosting brown pelicans at this site.*

**Rationale:** The availability and quality of roosting and loafing areas plays an important role in the energy budgets and reproductive potential of brown pelicans (Jaques and Anderson 1987). The availability of such areas has decreased in California due to continuing development along the coastline. Currently, the western pond levees, particularly the levee located between Ponds 10 and 11, provide important roosting habitat for this species. These areas are most frequently used between the months of June through December; however, the south bay is also an important roosting and foraging area for non-breeding pelicans throughout the year. Protecting roosting areas within the South San Diego Bay Unit would assist in implementing the primary objective of the California Brown Pelican Recovery Plan (USFWS 1983).

Objective 2.5 – California Brown Pelican				
<i>Comparison by Alternative</i>				
<i>Alternative</i>				<i>Strategy</i>
<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	
✓	✓			Continue current management within the salt pond complex and monitor the use of the pelican platform installed in the eastern primary ponds.
		✓	✓	Maintain appropriate pelican roosting habitat along the salt pond levees and on the pelican platform, monitor population levels during and after restoration, and implement management actions to reduce disturbance and encourage continued pelican roosting within the area.

**GOAL 3:** Provide high quality foraging, resting, and breeding habitat for colonial nesting seabirds, migratory shorebirds and waterfowl, and salt marsh-dependent species.

***Objective 3.1: Colonial Nesting Seabirds***

*When funding is available, increase the quality of nesting habitat available for colonial seabirds to maintain species diversity and reduce crowding. Accomplish this by enhancing at least ten acres of the existing levee system (through levee widening, recontouring of levee slopes, and capping the improved levees with six to 12 inches of sand) and by creating a minimum of 36 acres of new nesting habitat within the salt pond complex.*

**Rationale:** Many colonial nesting waterbirds face threats to the stability of their populations due to degradation of coastal and marine habitats, depletion of the forage base, and contaminants. Since 1985, six species of colonial waterbirds have established nests at the salt works. Three of these species, the gull-billed tern, elegant tern, and black skimmer, are included on the Service's list of Birds of Conservation Concern (USFWS 2002). Enhancing nesting opportunities and managing the site to reduce threats to nesting success will encourage the continued use of the salt pond levees as nesting habitat for these species.

Objective 3.1 - Colonial Nesting Seabirds				
<i>Comparison by Alternative</i>				
<i>Alternative</i>				<i>Strategy</i>
<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i>	
	✓	✓	✓	Enhance the existing substrate on a minimum of 10 acres of levee area around the salt ponds by adding six to twelve inches of light colored sand to improve nesting conditions for ground nesting seabirds.
	✓	✓	✓	Inspect nesting areas annually to determine if maintenance is required to ensure the availability of quality nesting habitat.
	✓	✓	✓	Install temporary fencing across levees to minimize access to nesting areas where mammalian predation is identified as a problem.
	✓	✓	✓	Remove debris and miscellaneous structures that could serve as an avian predator perch, and eliminate potential access routes that provide mammalian predators with easy access into the colony.
		✓	✓	Install new fencing and regulatory signage to minimize disturbance in the nesting colonies and periodically remove vegetative cover on and adjacent to the levees to maintain open views for the nesting seabirds.

Objective 3.1 - Colonial Nesting Seabirds (Continued)				
Alternative				Strategy
A	B	C	D	
		✓	✓	Monitor nesting activity on the levees to determine the effects, if any, of restoration <u>on nesting seabirds</u> . If after considering the <u>results of the monitoring data from this and other seabird nesting areas</u> , it is determined that restoration is resulting in reductions in the diversity and/or density of seabird nesting on the levees, specific management actions, such as intensifying predator management, reducing human disturbance, and/or restoring an open water component around some of the levees would be taken.

**Objective 3.2: Brine Invertebrates**

*Over the life of the CCP, maintain a stable source of brine invertebrates as forage for breeding, migrating, and wintering birds by managing approximately 44 acres of salt ponds at salinity levels ranging from 80 to 120 ppt.*

**Rationale:** Although no formal studies of the foraging habits of the birds that frequent the salt ponds have been conducted to date, anecdotal observations of avian activity and the results of studies from other similar environments, such as Mono Lake, indicate that the brine invertebrates produced in the salt ponds provide important forage for an number of avian species, including phalaropes and grebes. Brine invertebrates produced in the salt ponds likely provide an important resource for some birds migrating along the Pacific Flyway; consequently, the Refuge would continue to maintain a viable brine invertebrate population whether or not salt production continues at this site.

Objective 3.2 - Brine Invertebrates Comparison by Alternative				
Alternative				Strategy
A	B	C	D	
✓				Provide a source of brine invertebrates by continuing the current solar salt operation.
	✓	✓		Continue to provide conditions favorable to brine invertebrates within the reduced solar salt operation.
			✓	Develop a water management plan that includes hypersaline ponds to support brine invertebrates in the absence of salt production.
	✓	✓	✓	Improve shorebird access to brine invertebrates by <u>increasing the area available for foraging within the salt pond complex</u> . This could <u>be achieved by</u> reducing water levels in some ponds during migration and recontouring the levee edges to reduce steep slopes and increase the available shoreline.

**Objective 3.3: Shorebirds**

*Manage the South San Diego Bay Unit in a manner that would continue to support significant numbers of shorebirds (approximately 70 percent of all birds observed on the South San Diego Bay Unit within a given year) prior to, during, and after proposed enhancement and restoration actions.*



**Rationale:** Shorebirds represent a significant proportion of bird use within this Refuge Unit during the nonbreeding period. Many of these shorebirds are identified as either Birds of Conservation Concern (USFWS 2002b) or considered highly imperiled or of high conservation concern by the U.S. Shorebird Conservation Plan (2004). Because available habitat for these birds is limited within San Diego Bay, emphasis should be placed on protecting and enhancing the existing habitat for these species within the South San Diego Bay Unit.

Objective 3.3 - Shorebirds <i>Comparison by Alternative</i>				
<i>Alternative</i>				<i>Strategy</i>
A	B	C	D	
	✓	✓	✓	Conduct an updated year-long bird survey similar to that conducted in 1993 and 1994 to establish a baseline for comparing current and future conditions at the site.
	✓	✓	✓	Monitor shorebird use within the Refuge Unit throughout the implementation phase of the CCP to record use patterns, species diversity and abundance, and observed responses to restoration. Consider the results of this monitoring in future restoration phases.
	✓	✓	✓	Minimize disturbance to shorebird foraging, loafing, and nesting habitat during the implementation of CCP.
		✓	✓	Maintain communication with other entities involved in salt pond restoration during the development and implementation of detailed restoration plans to learn from their research and observations.
		✓	✓	Consider the nesting requirements of black-necked stilts, American avocets ( <i>Recurvirostra Americana</i> ), and killdeer ( <i>Charadrius vociferous</i> ) during detailed restoration planning for the salt ponds.

***Objective 3.4: Minimize Disturbance to Wintering Birds***

*Within three years of CCP approval, reduce disturbance to rafting brants, scoters, and other wintering waterfowl and to shorebirds foraging along the Refuge's intertidal mudflats by reducing the number of boats exceeding the 5 mph speed limit in the South Bay to less than five per month.*

**Rationale:** Shorebirds rely on intertidal habitat for feeding, roosting, and resting. Unfortunately, the loss of intertidal habitat has been the most severe among the habitats lost to development within the bay (U.S. Navy 2000). Of the 976 acres of intertidal habitat that remain in San Diego Bay, the majority occurs in the South Bay. As a result, large concentrations of shorebirds can be observed in these areas during the winter months. Between 1993 and 1994, the Service made 50,000 bird observations, primarily shorebirds and seabirds, on the intertidal mudflats to the north of the salt ponds (USFWS 1994). Equally important to wintering birds, such as black brant and surf scoter (*Melanitta perspicillata*), is the South Bay's shallow subtidal habitat.

Because this important migratory and wintering bird habitat is concentrated in one general location, it is critical to properly manage human activities within this area to minimize disturbance. Migratory and wintering birds generally attempt to minimize time spent in flight and maximize time for feeding. Flight requires considerably energy. Studies undertaken to evaluate the effects of boating and other human activities on migrating and wintering birds have concluded that continued disturbance poses a serious threat to the continued use of an area by avian species (DeLong and Schmidt 2002). Human disturbance can result in changes

in feeding habits and locations, feeding only at night, loss of weight, and/or complete abandonment of a feeding area (*Korschgen and Dahlgren 1992*). It is essential to properly protect this habitat in order to preserve its value for migratory and wintering birds.

Objective 3.4 - Minimize Disturbance to Wintering Birds <i>Comparison by Alternative</i>				
<i>Alternative</i>				<i>Strategy</i>
A	B	C	D	
✓	✓	✓	✓	Continue to patrol activities around the salt works from the pond levees using law enforcement staff and biological monitors.
	✓	✓	✓	Acquire a patrol boat and dedicate law enforcement staff to patrol the open waters of the Refuge at least twice a month during the winter months to enforce the 5 mph speed limit within Refuge waters.
	✓	✓	✓	Delineate the boundaries of the Refuge using signs and buoy markers within the open bay by 2008. Incorporate informational signage <u>on these markers that explains why boaters should</u> adhere to the 5 mph speed limit and encourages boaters to maintain appropriate distances from the shoreline and exposed mudflats.
	✓	✓	✓	<u>Partner with other agencies, such as the Port and the cities of Chula Vista, Coronado, and National City to inform boaters and others about the importance of protecting the resources within the Refuge. This could involve placing signs at marinas, boat launch facilities, and fishing piers, conducting interpretive programs, and providing interpretive displays in various locations around the south bay.</u>
	✓	✓	✓	Using the results of monitoring activities conducted within the Refuge, evaluate the effectiveness of current signage, as well as enforcement actions, to control and ultimately eliminate unauthorized activities in proximity to the Refuge's intertidal mudflat and salt marsh habitat.

**GOAL 4:**      **Provide opportunities for compatible wildlife-dependent recreation and interpretation that foster public appreciation of the unique natural and cultural heritage of South San Diego Bay.**

***Objective 4.1: Wildlife Observation and Photography***

*When funding is available, create four observation sites around the perimeter of the Refuge and provide some limited access into the restored salt ponds through guided nature tours and a 1.5-mile interpretive trail around Pond 28. The intent is to provide opportunities for the public to observe the sights and sounds of the Refuge without compromising the feeling of isolation that the salt ponds provide for the tens of thousands of birds that utilized the area each year.*

**Rationale:** Very few opportunities for wildlife observation and photography exist on the Refuge today. Expanding these opportunities would allow visitors to experience the variety of avian species that utilize the salt ponds and the open waters of the bay throughout the year. Wildlife observation and photography are two of the six priority public uses of the NWRs; when provided, these uses serve to promote a broader public understanding of the value of natural resources and the need to conserve these resources. Every effort should be made to facilitate opportunities for wildlife observation and photography when they can be provided without compromising wildlife and habitat values.

Objective 4.1 - Wildlife Observation and Photography <i>Comparison by Alternative</i>				
<i>Alternative</i>				<i>Strategy</i>
A	B	C	D	
✓	✓			Maintain the current opportunities for wildlife observation and photography.
		✓		Expand opportunities for wildlife observation and photography by opening the northern levee of Pond 11 to public access.
		✓	✓	Construct a <u>pedestrian pathway</u> along the Bayshore Bikeway from 7 <sup>th</sup> Street to 10 <sup>th</sup> Street <u>and Florida Street to 13<sup>th</sup> Street</u> in Imperial Beach.
		✓	✓	Increase the number of guided nature tours provided at the salt works to two per month outside of the nesting season.
			✓	Establish observation points <u>along the proposed pedestrian pathway</u> (near the terminus of 7 <sup>th</sup> Street, 8 <sup>th</sup> Street, 10 <sup>th</sup> Street, and 12 <sup>th</sup> Street in Imperial Beach and along the eastern edge of Pond 29 in Chula Vista) around the perimeter of the Refuge.
			✓	Following closure of the salt works, construct a 1.5-mile nature trail around Pond 28.

***Objective 4.2: Environmental Interpretation***

*Within five years of the CCP's approval, prepare a step-down interpretive plan that includes five interpretative areas along the perimeter of the Refuge where the need for habitat conservation and restoration and the role this Refuge plays in avian migration will be interpreted. A minimum of 20 percent of the interpretive elements proposed in the plan should be directed at new or non-traditional visitors. Prior to closing the salt works, develop a program to interpret the historical significance of solar salt production in San Diego Bay.*

**Rationale:** Environmental interpretation is a use identified in the NWRS Improvement Act of 1997 as one of the six priority public uses of the NWRS. It provides an important tool for increasing public awareness of the importance of the Refuge's many resources, while also building public understanding and support for the need to limit public access in some portions of the Refuge.

Objective 4.2 - Environmental Interpretation <i>Comparison by Alternative</i>				
<i>Alternative</i>				<i>Strategy</i>
A	B	C	D	
		✓	✓	Partner with other agencies to incorporate topics related to Refuge resources in other interpretive programs around San Diego Bay.
			✓	Prepare and implement an interpretive plan for three observation areas along the Bayshore Bikeway (at 13th, 10th, and 8th Streets).
			✓	Develop an interpretative path at the 10 <sup>th</sup> Street site that addresses environmental education and habitat restoration.
			✓	Develop a program to interpret historic hunting activities on the South Bay and hunting within the NWRS.
			✓	Develop an interpretive program to address the historic significance of the salt works to the solar salt industry and the region.
			✓	Develop interpretive materials for the Pond 28 trail.

**Objective 4.3: Environmental Education**

*Continue to seek partners to provide funding, volunteer support, and students for the Habitat Heroes environmental education program conducted on the Refuge to serve approximately 500 second grade through junior college students annually.*

**Rationale:** Many opportunities exist to work together with partners to develop environmental education programs. The Refuge staff, in partnership with others, has successfully developed such programs at the Sweetwater Marsh and South San Diego Bay Units. These programs, including Sweetwater Safari and Habitat Heroes, have been well received by the educational community. The Habitat Heroes program has focused on the serving the communities of Imperial Beach and Otay-Nestor, but could be expanded to reach a larger audience in the South Bay if additional funding is identified. The San Diego NWR Complex has and will continue to participate on a regional level in coordinating and encouraging these types of environmental education efforts as they are essential to implementing the purposes of the Refuge and the mission of the NWRS.

Objective 4.3 - Environmental Education <i>Comparison by Alternative</i>				
<i>Alternative</i>				<i>Strategy</i>
A	B	C	D	
			✓	Seek funding partners to establish the Habitat Heroes program as a permanent environmental education program for the Refuge.
			✓	Participate in ongoing discussions with other local agencies and organizations regarding the creation of an interagency Environmental Education Facilitator for the South Bay.

**Objective 4.4: Fishing and Boating**

*Maintain the current level of recreational boating and fishing opportunities occurring in the open water portions of the South San Diego Bay Unit.*

**Rationale:** Recreational boating and fishing are permitted uses throughout most of San Diego Bay, including the open waters of the South San Diego Bay Unit. Fishing is one of the six priority public uses of the NWRS that are to receive priority consideration in Refuge planning. Boating, although not a priority public use, can provide opportunities for other priority uses including fishing, wildlife observation, photography, and environmental interpretation. Refuge resources can be protected, while also providing opportunities for boating and fishing.

Objective 4.4 - Fishing and Boating <i>Comparison by Alternative</i>				
<i>Alternative</i>				<i>Strategy</i>
A	B	C	D	
✓	✓	✓	✓	Continue to allow fishing in the open bay portion of the Refuge per State regulations.
		✓		Expand recreational fishing opportunities in the Refuge to include fishing from the northern levee of Pond 11.
✓	✓	✓	✓	Continue to allow recreational boating in the open bay portion of the Refuge in accordance with the requirement that all water vessels maintain a speed of five miles per hour.

**Objective 4.5: Cultural Resource Program**

*Implement a proactive cultural resource management program that focuses on meeting the requirements of the National Historic Preservation Act, including consultation, identification, inventory, evaluation, and protection of cultural resources.*

**Rationale:** It is the policy of the Service to identify, protect, and manage cultural resources located on Service lands and affected by Service undertakings, in a spirit of stewardship, for future generations. Cultural resources that occur within the boundary of this Refuge Unit provide important opportunities for interpretation and education for a diverse audience and therefore warrant the development of a comprehensive cultural resource management program for the Refuge Unit.

Objective 4.5 - Cultural Resource Program				
Comparison by Alternative				
Alternative				Strategy
A	B	C	D	
✓	✓	✓	✓	Conduct a cultural resource survey of the Otoy River floodplain according to the regulations of the NHPA and test all sites that have not yet been evaluated for eligibility to the NRHP.
✓	✓	✓	✓	Create and utilize a Memorandum of Understanding with Native American groups to implement the inadvertent discovery clause of the Native American Graves Protection and Repatriation Act (NAGPRA).
	✓	✓	✓	Assess the effects of enhancement and restoration activities on the use, design, and function of the salt works according to the regulations of the NHPA.
		✓	✓	Develop a treatment plan to address adverse effects to the South Bay Salt Works. Stipulate the implementation of the treatment plan in a Memorandum of Agreement (MOA) with SHPO and the Advisory Council on Historic Preservation and consult with interested parties.
		✓	✓	Develop an interpretive program that presents accurate information about Native American history within the South Bay.